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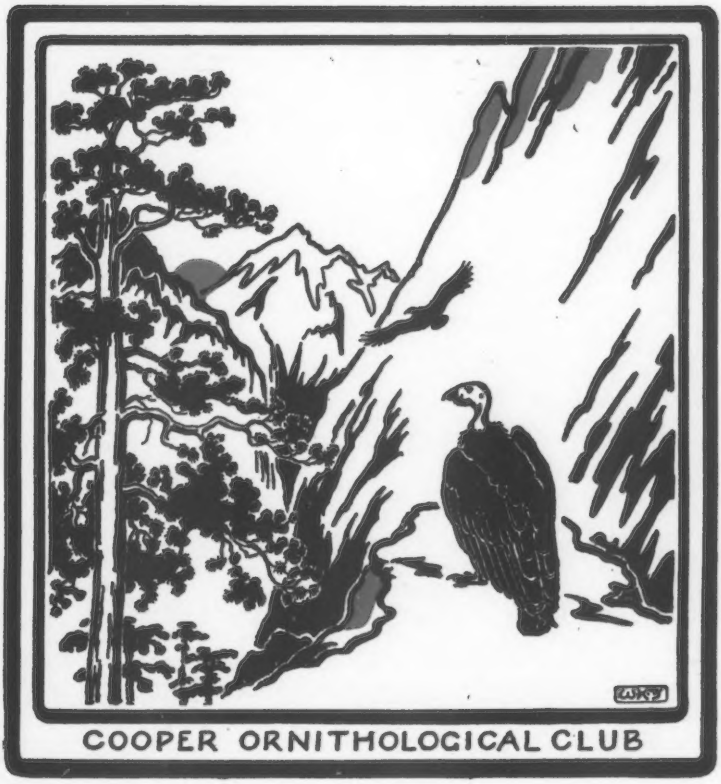
THE CONDOR

A Magazine of Western Ornithology

Volume XL July-August, 1938 Number 4



COOPER ORNITHOLOGICAL CLUB

THE CONDOR

A Magazine of Western Ornithology

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THE CONDOR

VOLUME XL JULY-AUGUST, 1938 NUMBER 4

BARS IN FLIGHT FEATHERS

WITH FIVE SETS OF ILLUSTRATIONS

By HAROLD MICHENER and JOSEPHINE R. MICHENER

INTRODUCTION.—Probably our first attention to the significance of the more or less evenly spaced bars across the flight feathers of many birds was called forth by the late J. Eugene Law who told us of his experimental attempts to determine the rate of replacement of plucked feathers in the tails of banded towhees. These feathers showed distinctly fairly uniform bars across them. Mr. Law then suggested that each bar might represent a day's growth of feather but, so far as we know, he reached no definite conclusion in regard to this.

When we began a study of the molt of the House Finch (*Carpodacus mexicanus frontalis*) about three years ago we soon found that some flight feathers show bars and others do not, so we undertook to find out some facts about them. Now we are of the opinion that a paper on the bars and other markings of flight feathers, not including the feather patterns of birds that have such patterns, should be presented in advance of the one we contemplate on the molt of the house finch.

House finches have been our greatest source of information on this subject, but we have observed barred feathers also in every species of bird that we have handled in appreciable numbers.

METHOD OF STUDY.—In our study of the bars we plucked from many birds, mostly juvenals, as we trapped and banded them, the left ninth primary and the first and second right rectrices, selected, not because of intrinsic value greater than other flight feathers, but merely to establish a uniform practice. In this way the plucked feathers of approximately 1500 juvenal birds, predominately house finches, were preserved for comparison with the replacement feathers, many of which were studied without plucking and about 50 of which were collected for more detailed examination. Furthermore, after the study of the bars in feathers was begun, all the birds that were handled during our banding operations, some 3500 new birds annually and uncounted multitudes of repeats, were examined with this in mind.

DESCRIPTION OF BARS.—These bars consist of alternate apparently dark and light streaks lying approximately parallel across the webs of the feathers, the proximal angles between the bars and the rachis being somewhat less than 90 degrees on each web. For convenience we will speak of the apparently dark streaks as the bars. In the webs the bars resemble watermarks in paper. They are not equally visible in the corresponding feathers of all birds even of the same species, but grade from absent, at one extreme, to easily apparent, at the other.

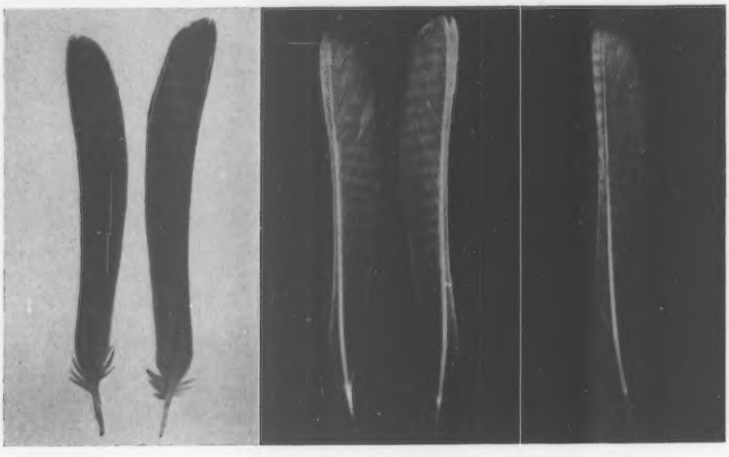
We speak of the bars as being *apparently* darker than the spaces between because we do not wish to be understood as saying that there is a color difference. This will be discussed later. However, we do know that the bars are less translucent than the spaces between them, as evidenced by the appearance of a black and white pattern when viewed through a barred feather, by the dark bars visible across the shadow of a well barred feather, and by the shadow prints made by placing the feather directly on

photographic paper. These prints, in the cases of many feathers, show the bars about as distinctly as they can be seen in the feathers themselves.

The most distinctly barred feathers show a structural difference between the bars and the intervening spaces, which accounts, at least in part, for the difference of appearance. The dorsal surface of the rachis is wavy in the dorso-ventral plane, especially in its proximal section, as can be observed by looking across the feather parallel to the plane of the vane. The dorsal surfaces of the webs are wavy, the crests of the waves matching the waves in the rachis and coinciding, approximately, with the center lines of the bars. This waviness can be seen by pointing the distal end of the feather toward the light and looking along the feather with a hand lens. When the waves can not be seen by this method they often are apparent in both rachis and webs by the bright streaks of specular reflection that ride over the bars as the feather is tilted lengthwise through a small angle. On the ventral surface the bars in the webs are slightly less apparent than on the dorsal side and they show little, if at all, on the rachis. This surface of the webs and the rachis seems to lack the waviness coincident with the bars, judging from the even sheen of specular reflection over the whole surface. There are a few exceptions in which a slight waviness is indicated. In these exceptions the crests of the waves on the ventral side are opposite those on the dorsal side. If these observations of waviness on one or both sides are correct, and we believe them to be, the webs and the rachis are thicker at the bars than between the bars.

When the vane of a well barred feather is only partly expanded, the bars of the proximal portion still held by the sheath can sometimes be seen through the sheath as dark transverse bands.

In addition to the bars that show in the webs and the rachises there are in the calami of feathers of all plumages transparent membranes which appear, from the outside, to be transverse partition walls dividing the calami into sections. (See figs. 38, 40, 41.)



a *b* *c* *d* *e*

Fig. 38. Barred tail feathers of House Finch. Photographs *a* and *b*, and shadow prints *c* and *d*, are of same pair of outer tail feathers, the most distinctly barred House Finch feathers we have seen, collected after the studies for this paper were completed. Shadow print *e* is of normally strongly barred House Finch tail feather.

Upon examining a longitudinal section of the calamus these membranes appear to form a row of capsules each with its ends pressed tightly against an end of the two adjacent capsules and with the side walls pressed against the walls of the calamus tube, often so closely as to be indistinguishable, with low magnification, from the main wall of the calamus. It is not uncommon, especially in the distal portion of the calamus, to find the capsules partially collapsed, apparently being forced away from one side of the calamus tube, with the end walls a more or less crumpled mass. In the proximal section of the calamus the capsules are short compared with their diameters, being, in fact, thin discs, while in the distal section they may be as long as several times their diameters. If a feather is plucked before it is entirely grown, it bleeds at the proximal tip and the calamus is left empty, or partially empty, of these membranous capsules, depending upon its degree of immaturity. (See feathers *a* and *c*, fig. 38, and *a*, fig. 41.)

In a large majority of barred feathers the spacing of the bars is remarkably regular for a given species, but irregularities of considerable magnitude are not uncommon. These variations in spacing may occur between feathers from different individuals of the species, between different feathers grown on the same individual at different times, between feathers grown from the same feather follicle at different times, and between different sections of the same feather. Although there are these variations, barred feathers grown simultaneously on the same bird are sure to have similar spacing of the bars; for example, if two or more remiges on one or both wings are dropped at the same time, either naturally or fortuitously, all the replacement feathers will be similarly barred. The same is true for the rectrices.

Number of Bars in Remiges.—It is only in a few of the most strongly barred feathers that the bars can be counted exactly and definitely the whole length of the vane, and even in these it is usually necessary to count the bars in the webs for part of the distance and in the rachis for the remainder. In our experience the bars in the rachis never can be counted for its entire length and the bars in the webs rarely can be counted for their entire lengths, the most uncertain parts being the distal and proximal extremes of the rachis and the proximal parts of the webs.

To determine the number of bars in the ninth primary of a house finch 11 such feathers, which had grown to replace plucked juvenal feathers, were selected because their bars could be counted the whole length of the webs with considerable accuracy. In only two was it necessary to estimate the number of bars for a small portion of the proximal end of the vane because they could not be seen either in the webs or the rachis. These 11 feathers averaged 17 bars in the vanes and varied from 15 to 20 for individual feathers. The vane lengths varied from 44 mm. to 51 mm., with an average of 47 mm. The spacing of the bars averaged 2.7 mm. for all 11 feathers, 3.4 mm. for the feather with the maximum spacing, and 2.2 mm. for the feather with the minimum spacing.

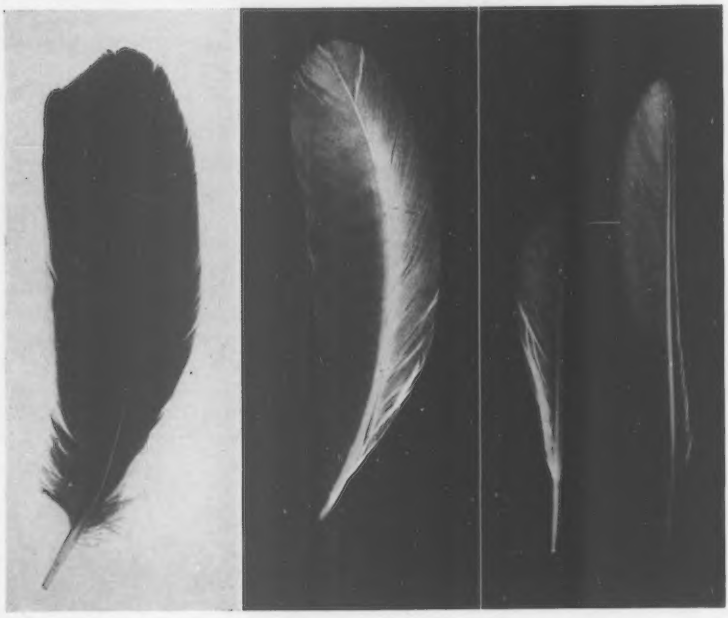
These 11 feathers are representative of all the postjuvenal or later primaries of the house finch, regardless of the age or sex. The bars have been counted in many more, and 16 or 17 are the usual numbers for the vanes.

Rate of Growth of Remiges.—The number of days required by a house finch for the replacement of a ninth primary averages 27, with a minimum of 21 and a maximum of 35, as found from 25 birds which gave reasonably accurate information on this point. Not all of these birds were in hand on the exact day that the feather reached its full length; but some of them were, including the ones that established the maximum and minimum limits. For most of those which were not in hand on the crucial day, the trends of their curves showing length of feather plotted against time in days since the preceding feather was plucked indicate that their feathers reached full length between these time limits. The method of measuring the lengths of these feathers was not suf-

ficiently accurate, nor did many of the birds come to us often enough to give entirely satisfactory rate-of-growth curves. However, these curves do show clearly that during the first 12 to 19 days after the preceding feathers were plucked the average rate of growth was considerably less than it was for all or nearly all of the remainder of their growths. During this early period, in which the tips of the primaries were growing out to the tips of the coverts above them, we made no measurements of these primaries because they were so easily injured when searching among the coverts to find them. Some of the curves show a diminution in the rate of growth for the last few days before full length is reached.

NUMBER OF BARS AND RATE OF GROWTH OF RECTRICES.—A similar study of the tail feathers gave an average of about 23 bars in the vane, 21 of which could be counted in the webs or rachis, with room for about 2 more bars where they could not be seen at the proximal end of the vane. The spacing of the bars averaged approximately 2.8 mm. The most distinctly barred house finch tail feathers we have seen were collected recently and are shown in figure 38, *a*, *b*, *c*, and *d*.

Growth curves for the first and second right rectrices replacing plucked juvenal feathers were plotted from the available data for 36 birds and the time for the growth of these feathers, measured from the plucking of the preceding feathers, was determined



a *b* *c* *d*

Fig. 39. *a*, *b*, Barred secondary of California Jay. In the feather the bars show plainly in both webs, but neither photograph (*a*) nor shadow print (*b*) show them in outer web, which is blue part of feather. *c*, *d*, Shadow print of tail feathers collected in November from adult Gambel Sparrow: *c*, late autumn replacement of postnuptial feather; *d*, normal postnuptial feather.

to be an average of 33 days, with a minimum of 28 and a maximum of 39. These rate-of-growth curves have the same characteristics as those plotted for the primaries. For the rectrices we have ample observations to justify the statement that it requires 6 or 7 days after plucking for the new rectrix to appear at the surface of the skin.

NUMBER OF CAPSULES IN CALAMUS.—We hesitate to suggest even remotely that one of the capsules in the calamus has any relationship to one day's growth of that part of the feather, because we know so little about the manner in which a feather is formed. However, it is a fact which should be recorded, that in house finch remiges and rectrices there is little deviation from the average of 11 in the number of capsules in each calamus. It is also a fact, the meaning of which we do not know, that 11 added to the average of 17 bars found in the vanes of the remiges gives 28, while 27 days was the average growing time found for these feathers. Similarly for the rectrices, 11 added to the average of 23 bars in the vanes gives 34, while 33 days was the average growing time found for these feathers. We would like to be able to say that this shows the number of bars in the vane plus the number of capsules in the calamus to be equal to the number of days consumed in the growth of the feather. We are very doubtful whether this can be true and attempt toward proof is beyond the scope of our present work.

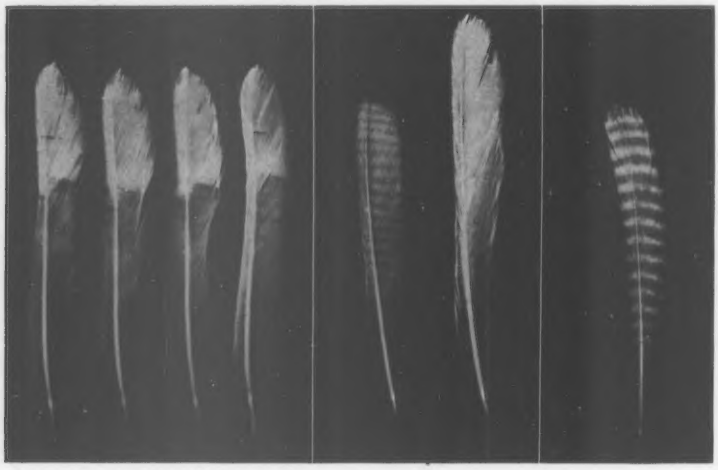
DANGER OF BASING CONCLUSIONS ON MEAGER DATA.—While speaking of the rate of growth of feathers we wish to digress slightly to point out the danger in drawing conclusions from insufficient data, even though these data appear to point definitely to those conclusions. After recording our observations for a summer and fall we undertook to determine the rate of growth of the tail feathers of a house finch. Records on 5 birds were found that seemed to be sufficiently complete to be worth while plotting as rate-of-growth curves. When plotted, the points lay remarkably close to two straight lines starting at zero length and at 6 and 7 days, respectively, and rising at the rate of one-eighth inch in length (3.2 mm.) for each additional day. We were elated with the definite answer and, with considerable confidence, developed the following formula for the rate of growth of house finch rectrices: 6 or 7 days after plucking until feathers show outside of the skin, then one-eighth inch per day until fully grown. But other gaps in our records caused us to continue our studies for another year, at the end of which time a sizable sample of the data on hand gave no such definite answer to the question, as has been indicated already in this paper.

SOME ADDITIONAL INSTANCES SHOWING THE PERIODICITY OF BARS.—At one time we kept in captivity for 31 days four house finches from which we had plucked half the tail feathers, the left primaries 8 and 9, and the left secondary number 1. At the end of this time the primaries were nearly full length and the tail somewhat short of full length. These new feathers were collected from all four birds. Those from one bird in particular are well barred, it being possible to count with accuracy the bars on the two primaries, the secondary and four tail feathers. The other two tail feathers were not preserved. Each one of these feathers, all of which we know to be the same age, have 17 bars. The bars on the wing feathers of the other three are too faint to count and the tail feathers are too much worn to show the bars well the entire length. However, enough can be counted so that we feel sure that the tail feathers from one have 17 bars, from another 16 bars, and from still another 19 bars. The calami of all tail feathers of the two sets having 17 bars show about the same stage of immaturity, and the sheaths are clasping a few of the barbs; those on the set with 16 bars are less mature and the sheaths are appreciably higher on the barbs; and those on the set with 19 bars appear to be mature, having become clearer, and the barbs are nearly free from the sheaths. In one case we are sure that the simultaneously grown primaries, secondary and rectrices have the same number of bars, 17. The remiges are practically normal in length for fully

grown feathers, but the rectrices are about 10 mm. shorter than normal. The variation between the different birds in the number of bars in the rectrices might be assumed to be due to the feathers on the different birds starting to grow at slightly different times although the previous feathers were all plucked at the same time, or it may be due to the sheaths being broken away to a lower point on some than on others. However, it seems probable that these differences in the number of bars indicate the same differences in maturity that exist in the calami, as stated above.

Of the many barred feathers whose lengths we have recorded from time to time as the birds have been in hand and then have plucked for preservation, those from a few birds only, permit of counting the bars over sections of the vanes having definitely known growing periods. In the case of one of these birds (house finch 37-9872) the two tail feathers grew from 27 mm. long to 46 mm. long between observations on June 13 and June 21, a period of 8 days. The sections of these feathers between points 27 mm. and 46 mm. from the distal tips each contain 8 bars. In the first 5 days of this period the ninth primary increased in length from 25 mm. to 41 mm., and this section, measured from the distal tip, contains 5 bars.

The first and second left tail feathers were plucked from an adult Gambel Sparrow (*Zonotrichia leucophrys gambelii*) on October 21, 1937. They showed no bars. On November 20 the two new feathers were growing in, were the same length, and were distinctly barred, no. 1 being plucked to preserve the record of the bars. Early on the morning of November 26, no. 2 was plucked in order to compare it with no. 1 as it was 6 days before. In neither case was the feather fully grown. Both authors, counting independently, one not knowing the interval of time, obtained a difference of 5 in the number of bars. The time of day of plucking no. 1 rectrix is not known. It is presumed



a *b* *c* *d* *e* *f* *g*

Fig. 40. *a*, *b*, *c*, *d*, Shadow print of four rectrices from hand-raised House Finch; distal portions normal and proximal portions lighter, latter due to hand feeding. *e*, *f*, Shadow print of right no. 2 and no. 3 rectrices, collected in May from adult San Diego Song Sparrow. No. 2 is partially grown feather, showing bars, replacing one which had been lost, and no. 3, showing no bars, is old postjuvenal or postnuptial feather. *g*, Shadow print of rectrix of San Diego Bewick Wren, showing color pattern which coincides with diurnal bars.

that both feathers had the same number of bars when no. 1 was collected on November 20 and hence that no. 2 added 5 bars in the following approximately 6 days. The amount of sheath that has broken away from a growing feather can easily make a difference of one in the number of bars visible. In the case of another Gambel sparrow, no. 2 rectrix had 22 bars and no. 1 rectrix had 19 bars when collected 33 and 30 days, respectively, after the previous feathers were plucked, a difference of 3 in both the number of bars and the days of growth. Other examples give equally definite relationships between the number of days of growth and the number of bars.

On May 28, 1937, an immature house finch (37-9876) was banded and its left ninth primary and right rectrices no. 1 and no. 2 were plucked. Because of the interest of this bird's record we here reproduce our notes from our daily journal except that we use the days of elapsed time since plucking instead of the days of the month. All lengths of the primary are measured from the tip of the covert above it and the lengths of the rectrices are measured from the flesh at the bases of those feathers.

19 days, "no. 9 primary quill just at covert edge. Tail 25 mm. long."
21 days, "no. 9 primary 5 mm. beyond covert. Tail 1 and 2 are 29 mm. long."
22 days, "no. 9 pri. 5 mm. beyond covert. New tail 32 mm. long. Very finely barred. Kept no. 2 tail."
24 days, "no. 9 primary 10 mm. long. Tail 35 mm. long."
25 days, "no. 9 pri. 13 mm. long. Tail no. 1, 35 mm. long. This feather came out." (Apparently not preserved.)
26 days, "no. 9 primary 16 mm. long."
27 days, "no. 9 pri. 19 mm. long. On this very short primary can count 12 bars. Cf. 37–9846 same date."
28 days, "no. 9 primary 21 mm. long. Removed to show narrow bars."

The journal notes for 37–9846, an immature house finch banded and plucked May 27, 1937, which was cited for comparison, are:

28 days, "Primary 9 is 2 mm. short of normal. Can count approximately 12 bars on this primary. Tail feather no. 1 is 8 mm. short of normal; no. 2 is 5 mm. short of normal." (These tail feathers were not collected.)

One of the authors, without knowing the above journal entries, measured the collected feathers and counted the bars in them, for the first bird, and converted the "short of normal" measurements for the feathers of the second bird to lengths from the proximal ends of the calami, the normal total length of no. 9 primary and rectrices nos. 1 and 2 being 54 mm. and 65 mm., respectively, as determined by the measurement of a large number of feathers. The results for the no. 9 primaries of these two birds were as follows: 28 days after plucking previous feathers, 37-9876, the bird with slow growing feathers, total length 38 mm., length of vane beyond sheath 22 mm., number of bars in vane 13, average spacing of bars 1.7 mm.; 37-9846, the bird with faster growing feathers, total length 52 mm., number of bars in vane as reported in journal approximately 12.

It should be noted that the first of these feathers has practically the same number of bars as the second although it is 14 mm. shorter (about three-fourths as long); also, that the first had 13 bars as plucked at 28 days and 12 bars as counted on the bird at 27 days.

When the data for the first feather are plotted as a rate-of-growth curve, it lies in a fairly straight line which, if projected, reaches normal full-grown feather length at 35 days. This is the time that our other rate-of-growth curves indicated as about the maximum for the growth of no. 9 primary for a house finch. The tail feathers of these birds do not admit of comparison, as indicated in the journal notes.

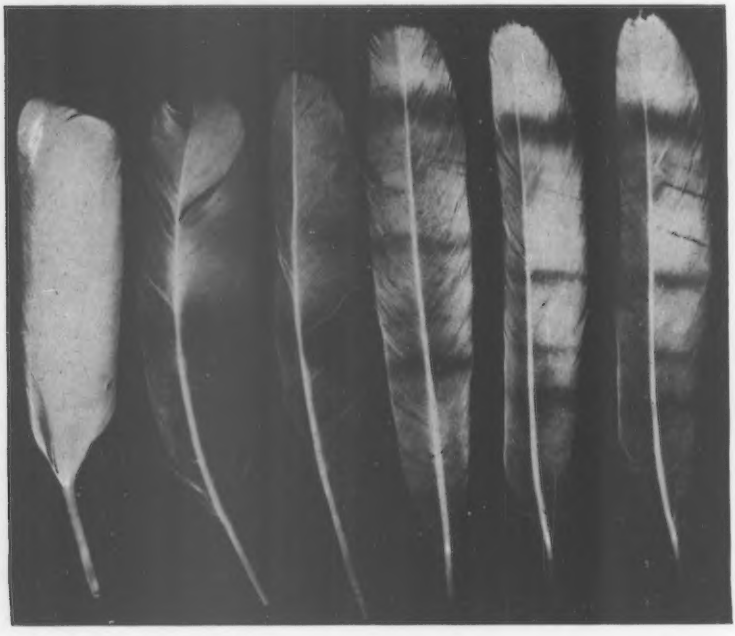
Summer Bars Less Distinct Than Winter Bars.—In the house finches that we have handled, flight feathers grown by birds of all ages in late fall and winter to replace those that have been lost show the bars much more distinctly than those grown in spring and summer.

Gambel sparrows arriving in the autumn show, in the tail and in the wings, no bars or only the faintest indication of bars; yet if a feather is lost after the bird's arrival the replacement feather shows bars more distinctly than the previous feather. (See fig. 39, *c* and *d*.) This is true of adults as well as immatures, and the contrast is greater than in the case of the house finches that live here all the year.

ARE THE BARS IN FACT DIURNAL?—Was Law correct in his surmise that the bars represent the daily increments of growth of the feathers? Are the dark streaks the parts formed in the day and the light streaks in the night, or vice versa?

It seems evident that the bars are due to some periodically recurring condition which affects the feather growth. The spacing of the bars is such that a little consideration leads easily to the suspicion that the frequency of the recurring condition corresponds with the day and night cycle. Both the number of bars in like feathers and the number of days required for such feathers to grow to full length have average values which most feathers quite closely approach.

If we assume that the number of days required for the vane of the feather to grow is the same as the number of bars in the vane, ninth primary averages 17 and first and second rectrices average 23 for house finches, the remainder of the average time required for each of these feathers to reach full growth, 10 days, does not seem to be too much



a *b* *c* *d* *e* *f*

Fig. 41. Shadow print of feathers of male Brewer Blackbird: *a*, postjuvenal primary; *b*, juvenal secondary; *c*, juvenal primary; *d*, *e*, and *f*, juvenal rectrices. All juvenal feathers show light bands (dark in figure). Postjuvenal feather is solid black of normal adult male, although it undoubtedly has replaced a juvenal feather having bands.

to be consumed in starting the growth of the feather after the previous feather is plucked and in the growth of the calamus.

Simultaneously grown flight feathers on the same bird have the same number of bars at any time previous to the full growth of the earliest developed vane, and on different birds this is true, with possibly a slight variation, even though the feathers on one bird may grow much more rapidly than on another.

Finally, by direct count, the number of bars added to a growing feather in a given number of days is equal to that number of days. For the above reasons we feel justified in concluding that these bars are formed diurnally. However, it probably is not the light of the day nor the lack of light of the night that acts directly on the bird or on its feathers for, if it were, the feathers of the juvenal also would be barred. The juvenal in the nest is inactive. It does little but convert food into growing tissue, the food usually being supplied by the parents in fairly even abundance from daylight to dark. When the bird is fledged and depending upon itself as a food gatherer much of its energy is spent during the daytime in physical activity. As the autumn and winter progress, the shorter days, lower temperatures and the lesser abundance of food make for greater consumption of energy during the shorter daylight period and for a greater contrast between the day and night conditions. We think Gambel sparrows illustrate this point most markedly. As previously stated they arrive here in the fall in postjuvenal or later plumages with flight feathers showing only faint bars if any at all. These feathers are grown while the birds are in the northern part of their range while the days are long and the nights are short. When we pluck these feathers in the fall or winter, here in latitude 34 degrees north, the new feathers are strongly barred and, on the comparatively few we have measured, show an average spacing of bars in the tail feathers of 3.2 mm., which is somewhat greater than that of the house finches.

KNOWN AND SURMISED EFFECTS OF CHANGES IN METABOLISM SHOWN IN FEATHERS.—That a change in food or some other cause influencing the metabolism of a bird does have a more or less profound effect upon the feathers that are growing at the time is illustrated, we think, in the bands that are often found, singly or in multiple, across the wings, the tail, and, in extreme cases, all the feathers of a juvenal plumage. In their usual form they are lighter in color than the remainder of the feathers. Sometimes there is a difference in texture or in some other quality, difficult to define, which causes a difference in appearance. They are always more translucent. Most young birds lack them but they are not rare and we have found them in practically every species we have handled.

It is only on birds in juvenal plumage, all the feathers of which grew at substantially the same time, that the bands are found to extend across all the flight feathers of wings or tail, with the possible exception of a bird of any age which has simultaneously lost and replaced all the feathers of a tail, for instance, and, during the growth of the replacement feathers, has experienced some condition which caused the bands to form. Any feathers of postjuvenal or later plumages may have these bands on individual feathers, but the bands will not line up as a band across several adjacent feathers unless those feathers grew simultaneously.

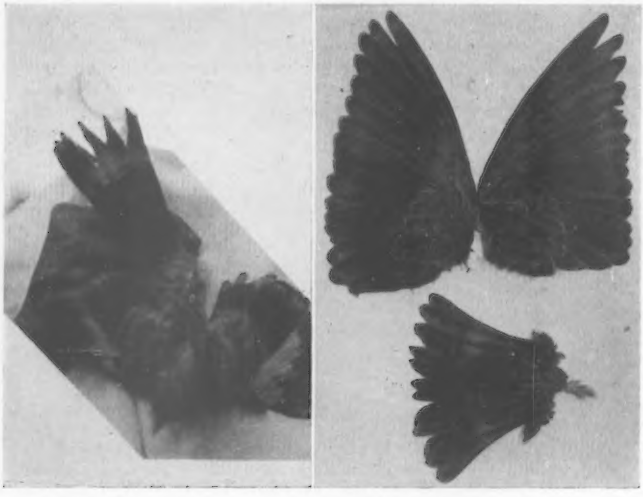
We think the bands are due to some experience in the bird's life which caused an abrupt change in the health of the bird—in the amount of energy available for feather growth, perhaps.

We have had two young house finches which were taken from their parents when very young. Both these birds had a definite dividing mark across the tail, the proximal sections of the feathers being lighter and more translucent than the distal sections. In the bird that was taken from its parents at the earlier age the distal edge of the band

was nearer the tip of the tail than in the other. A shadow print of four feathers from the one which was the older when transferred to hand feeding is shown in figure 40, *a*, *b*, *c*, and *d*. We think the division line dates for this bird a change in its metabolism, probably due to its change from parental to human care, and that whatever produced this change continued to influence these feathers during the remainder of their growth.

Another instance was that of a young house finch in normal juvenal plumage from which two tail feathers had been plucked. About two weeks after the feathers were plucked the bird sustained a broken wing and other serious injuries from an encounter with a cat. None of these injuries was in the region of the tail. The bird was put in a large cage with plenty of food and water and not disturbed for several days; then it was released. It soon was able to fly quite well. When the replacement tail feathers were nearly grown they were collected. There is an abrupt change in the appearance of these feathers about 5 mm. from the ends. This changed appearance is maintained for a distance of about 15 mm., and here the appearance becomes normal again. In this instance there are a few irregularly spaced light streaks interspersed with the bars in such a way that it is difficult to say whether the peculiar appearance is due to abnormal barring or to bands as we have defined them.

The cases cited, in which we know parts of the life histories of the birds which seem to explain the causes of the bands, are simple in band patterns and in probable causes compared with some of the band patterns we have observed and the multitude of events that might easily take place in a young bird's life and have an influence on its metabolism. Figure 41 shows a shadow print of tail feathers (*d*, *e*, and *f*), primary (*c*), and secondary (*b*) from the juvenal plumage of a male Brewer Blackbird (*Euphagus cyanocephalus*). The tail feathers in particular show three pronounced almost white bands



a *b*

Fig. 42. *a*, Photograph of Western Mockingbird in juvenal plumage, every feather of which is strikingly marked with light bands. *b*, photograph of wings and tail of Dwarf Cowbird showing light bands across rectrices, remiges and wing coverts.

and another not so pronounced. (Note that these shadow prints are negatives, white on the feather being black on the print.) If our conclusion as to the cause of these bands is correct, this bird had a number of variations in food supply, or in parasite attacks, or in something else that affected its metabolism. It might be thought that the light bands indicate partial albinism; but, if so, they should persist in the postjuvenal and later plumages, which they do not. Feather (*a*) in this figure is a postjuvenal primary taken from this bird. It is the normal shiny black of the adult male. Many young blackbirds marked similarly to this one have been trapped and recorded. They all molt into the normal postjuvenal plumage for male or female as the case may be.

Figure 42*a* is a photograph of the Western Mockingbird (*Mimus polyglottos leucopterus*) showing much banding in its juvenal plumage. We have not seen this bird again, but its postjuvenal plumage was probably that of a normal mockingbird.

Figure 42*b* is a photograph of the wings and tail of a juvenal Dwarf Cowbird (*Molothrus ater obscurus*) showing light bands across rectrices, remiges and wing coverts. A considerable portion of the young cowbirds captured have shown bands in their flight feathers. We are tempted to speculate upon what is the optimum food for a young cowbird. They evidently survive on a great variety of foods, judging from the great variety of known foster parents; but perhaps these bands indicate that their young lives are not all one continuous period of parasitic comfort with no pangs other than those due to overfilled stomachs.

Possible Relation of Bars to Color Pattern.—We have refrained from saying that the bars are in any sense a color pattern. The bars are particularly well marked in a Brewer Blackbird, yet it could not possibly be said that the blackbird feather shows a color pattern. Also the bars show distinctly in some white feathers. In the majority of the brown flight feathers of the house finch it has been difficult to decide whether the bars actually show a color difference, but occasionally there is one which seems to justify this distinction. This same is true of the California Jay (*Aphelocoma californica californica*), figure 39, *a* and *b*.

Judging from the relatively few Song Sparrows (*Melospiza melodia cooperi*) whose feathers we have examined, the juvenal flight feathers show bars faintly. The flight feathers of postjuvenal and later plumages show them much more plainly (fig. 40, *e* and *f*); the tail feathers, and particularly the two middle ones, sometimes show them so distinctly that we feel inclined to call them a color pattern.

In the tail of the San Diego Wren (*Thryomanes bewickii correctus*), figure 40*g*, there is an undoubted color pattern of bars; yet we believe, although the quantity of material examined is small, that these color bars are, in fact, the diurnal bars which we have been studying. With these suggestive observations we leave to our readers the question of how the wren's tail came to be barred.

CONCLUSIONS

1. Each of the bars in a flight feather, similar in appearance to a watermark in paper, represents a day's growth of the feather.

2. Most flight feathers of postjuvenal or later plumages show bars.

3. Juvenal flight feathers usually show no bars, though occasionally the bars are visible, especially in the tail.

4. Bands lighter than the normal color are not uncommon across the wings or the tail, or both, of a juvenal bird. In rare cases all the body feathers also show these bands. Bands probably are due to some metabolic deficiency resulting from some changed condition in the bird's life.

5. Bands may occur in postjuvenal or later plumages if a group of flight feathers is replaced simultaneously and if the bird, during the growth of these feathers, experiences conditions which will cause bands.

6. The presence of bands or the absence of bars justifies a strong suspicion that the feather is a juvenal feather.

7. The presence of bars justifies a strong suspicion that the feather is not a juvenal feather.

8. Feathers grown in late fall and winter have more pronounced bars than those grown in spring and summer.

9. The presence of a strongly barred feather in company with adjacent or corresponding feathers having no bars or but faint bars indicates that the strongly barred feather has replaced one lost from the normal plumage.

Pasadena, California, February 12, 1938.

NOTE.—As this paper is ready for publication, Dr. J. M. Linsdale cites to us "The Genesis of Fault-bars in Feathers and the Cause of Alternations of Light and Dark Fundamental Bars," by Oscar Riddle (Biological Bulletin, vol. 14, 1908, pp. 328-370). We recognize in Riddle's "fundamental bars" the bars described in our paper and in the results of his experimental work the information we have been wishing so much we had. However, our method of study and the results we present in addition to those presented by Riddle will justify, we hope, the presentation of this paper.—H. M. and J. R. M.

AN HOUR IN THE LIFE OF A BROAD-TAILED HUMMINGBIRD

WITH ONE ILLUSTRATION

By A. M. WOODBURY and JOHN W. SUGDEN

A small glade 80 feet in diameter in an opening in a natural forest of spruces and aspens formed the setting for the activities of a male Broad-tailed Hummingbird (*Selasphorus platycercus*). Here he displayed his incessant "feeding, fighting and flirting" as we observed him in the mating season on June 13, 1937, at the Utah Outdoor Camp in Big Cottonwood Canyon, Salt Lake County, Utah. The glade was densely studded with twinberry bushes (*Lonicera involucrata*) in bloom (about waist-high) interspersed with grasses and herbage of many kinds. The twinberry blossoms provided the food supply and, so far as we observed, he did not feed on anything else.

After fifteen minutes of preliminary observation, we began to make detailed notes of the bird's activities. A sketch of the area was made and the perching points most commonly occupied were numbered. The area was bounded on the north and northeast by heavy conifers (spruce and fir), into which the hummingbird seldom ventured. The west boundary was provided by a clump of aspens with an opening to the northwest providing an open passageway. To the south and southeast, the twinberry brush extended some distance beyond the scene of observation along the banks of two tiny streams that converged at this point. (See fig. 43.)

We found three adjoining birds apparently maintaining territory, one on each fork of the little stream where the twinberries were thick, as shown in the sketch, and the other to the northwest, downstream. The boundaries of the adjoining territories seem to have been definitely delimited; for two birds would perch close together on opposite sides of the "line" without showing hostility.

The bird under observation seemed to perch on twigs on the sides of either trees or bushes (never on top) where he could keep the entire area under observation. Favorite perches were located on the inner sides of trees around the border of the area, or else on bushes from which he could see the surrounding trees.

Occasionally a female entered the area and the male gave her a good deal of attention, sometimes dancing in the air with her, occasionally touching bills, but more often performing his characteristic dives, in which he would spiral up about as high as the tree tops and then dive rapidly toward the ground making a sweeping curve at the bottom and come up again on rapidly beating wings. The descent was generally marked by a peculiar rattling sound which gave way at the bottom to a decided cluck just as the sweep reversed and he started to rise.

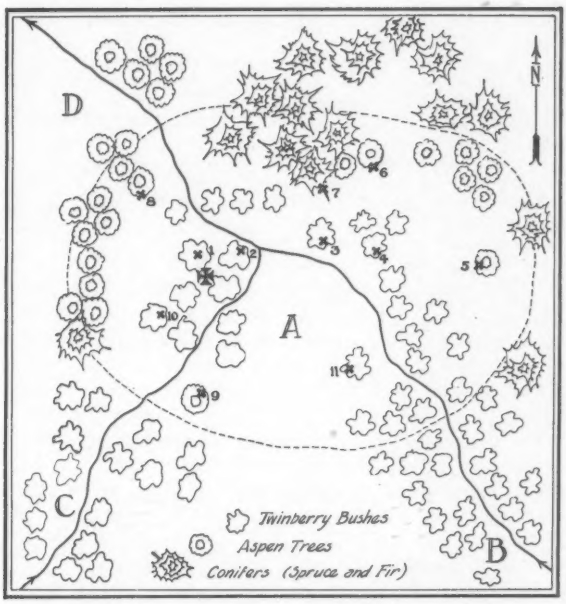


Fig. 43. Territory of a male Broad-tailed Hummingbird as observed June 13, 1937, in Cottonwood Canyon, Salt Lake County, Utah. The territory as outlined was about 80 feet in diameter. The cross indicates position of the observers. An x indicates each of the perches.

The female perched in the area several times, but always low in the bushes as though attempting concealment and, so far as was observed, never in an outlook position. The following notes show the detailed activities for 46 minutes.

9:59 a.m. Female entered territory and perched low in bushes. Male made two dives and sweeps, entered bushes with female, emerged and made two more dives, entered bushes again, danced in willows. Female perched low again.

10:04½. Male dived twice again and entered brush. Both emerged, flying up in the air, and both disappeared. Male soon returned and perched.

10:05. Chased a trespassing male off to NW.

10:06. Chased another male off to SE.

10:06½. Female returned, both in air together, touched bills. Female disappeared, male returned and perched. Several other males around outside of territory.

10:09. Began feeding from twinberry blossoms for half minute.

10:10. Drove off neighboring male and perched. Feeding again. Sparrow flew across territory without attracting attention. Feeding again.

10:12. Perched at no. 3, preened and twittered. Moved to no. 9 and chattered.

10:13. Dived twice, perched at 5, twittering.

10:13½. Perched in conifer 7, made five dives, perched at 5. Rattles in diving and clucks at bottom.

10:15. Two fights with neighboring males; four dives; fluttering in bushes with female; another dive.

10:16. Perched in unnumbered bush.

10:16½. Feeding.

10:18. Another fight; perched at 7.

10:19½. Dived once, then chattered at neighboring male close to no. 9, but did not leave territory; perched at 10.
10:20. Repeated chattering, then perched at 3, preening. Bird flew over territory, male twittered.
10:22½. Chased another male off to SE; began feeding.
10:24. Perched at no. 1, twittering and watching.
10:25. Chased another male off to SE; gone some time while male B flew around perch 5 twice and returned to his own territory.
10:26. Returned and began feeding.
10:28. Perched at 3, preening and fluttering wings. Moved to 11 and then to 8.
10:29. Female entered territory. Male made four dives and then perched at 8. Left territory to NW and soon returned to 8.
10:30½. Perched in conifer 7; two dives and perched at 5.
10:31½. Two dives and perched at 5. Moved to 9, then to 8.
10:32½. Three dives, perched at 8, began feeding, perched at 4.
10:33½. Chased male B off to SE; female quiet.
10:34. Feeding; perched at 11, moved to 4.
10:35. Perched at 8, chased neighbor D to N, perched at 5, moved to 8 and then returned to 5.
10:37. Perched at 8, dived and returned to 8.
10:39. Feeding; perched at 3, twittering.
10:41½. Perched at 8, dived four times and returned to 8.
10:43. Chased another male (probably male B) off to SE.
10:44. Made four dives, then fluttered in bushes with female; made another dive and disappeared.
10:45. Returned and dived, then chased another male.

Department of Zoology, University of Utah, Salt Lake City, Utah, March 1, 1938.

ANOTHER JAY SHOOT IN CALIFORNIA

By EMMET T. HOOPER

As representatives of the Museum of Vertebrate Zoology, Mr. F. H. Test, Mr. Frank Richardson and myself were given the opportunity to be on hand at a jay shoot held by the Associated Sportsmen of Calaveras County on January 30, 1938. This was the first organized shoot held by the association since the one of April 26, 1936, when, also, representatives of the Museum were present. The first shoot has been reviewed by Miss Mary M. Erickson (Condor, vol. 39, 1937, pp. 111-115).

The purposes of this brief report are, in the main, three: To review the method of conducting the shoot, particularly as differing from the one reported by Erickson; to record the number and kinds of "predators" taken; and to give certain opinions regarding wild life voiced by sportsmen interviewed.

The area covered by the shoot was approximately the same as in 1936 (about 375 square miles) and chiefly in the blue oak and digger pine belt. However, this year only a few more than one-half the number of men hunted over this same area and they returned with about one-third the number of birds. The drain on the jay population in the area was thus much less than in 1936.

Approximately 20 men took part in the shoot; about 30 men were present at a dinner held afterwards. No formal record was made by the Association of the number of men hunting, nor of each hunter's kill. The fact that fewer men, than in 1936, took part in this shoot may be explained on one or more of several counts. A dance was held the night before in San Andreas; it was said by some that the "aftermath" was a bit too much for certain individuals who normally could be expected to shoot. Some held that the inclement weather that day kept indoors erstwhile hunters. Others complained that the lack at that time of keen competition lessened the incentive to get hunters afield. Possibly all these factors can be summated in one reason, namely, lack of interest in the shoot as held.

In contrast to the 1936 shoot, no barbecue for members, wives and friends was held at the close of the day of hunting. Instead, members only met at "Toms Place," a restaurant and bar in Angels Camp, to count the kill and—perhaps most importantly—to dine together. No competing hunting teams were formed; consequently there was no losing side to bear the expenses of the dinner, as in 1936.

One hundred and sixty-six (166) Steller Jays (*Cyanocitta stelleri*), 63 California Jays (*Aphelocoma californica*), 1 Sharp-shinned Hawk and 1 House Cat (scalp only) were brought in to be counted. In addition, other birds were reported shot, but the hunters "just didn't bother to bring them in." The number of birds collected per man ranged from 3 to about 50, averaging about 11. In 1936, the average number per man was about 30.

Several explanations were offered by the hunters to account for the discrepancy between the number killed during these two years. The inclement weather was said to have much to do with the fewer obtained this year. It was said to be important for this reason. "When the weather is cold and cloudy the jays remain within cover. They are not easily flushed. If they are flushed they fly to a tree, hop through the branches to the opposite side, then fly away to denser cover. On warm, sunny days they are flushed easily, fly into the bottom reaches of a nearby tree, then hop through the foliage to the top of the tree before again taking to wing. This latter performance allows for a closer approach to the tree before shooting." While scouting about during the afternoon of the shoot we saw comparatively few birds; perhaps the birds were "hanging close to the brush."

The proportionately greater number of Steller Jays over California Jays collected was explained by some men interviewed. With the advent of winter the jays migrate down-mountain, the "Mountain Jays" (Steller) moving from the yellow pine belt down into the blue oak-digger pine belt; "Blue Jays" (California) in turn migrate [possibly as the result of the population pressure from the increased number of Steller Jays in the blue oak belt] farther down-mountain onto the lower foothills. The reverse process occurs in the spring; the birds move to higher levels. Comparison of the relative numbers of the two kinds killed in January (the present shoot) with those taken in April (1936 shoot) will substantiate the above observations. In January, there were 2.6 Steller Jays per 1 California Jay taken; in April-taken jays the ratio of Stellers to Californias was about .54 to 1.

Little new information regarding the effect of jays on quail populations can be added to that already given by Miss Erickson. Several men stated that they have noticed no change in either the quail or the jay populations since the 1936 shoot. It is probable that only the surplus population—at least as regards jays—is taken, when shoots are held no more frequently than once every 1½ years. Normally (that is, without shooting) this same surplus would be removed by environmental factors exclusive of man.

Feral House Cats apparently have no friends among the sportsmen of Calaveras County. Each association member probably secures considerable satisfaction each time he bags a feral cat. One man reported that he had taken 7 domestic cats in his steel-trap line within a period of 1½ weeks. This line was located about 1½ miles from the nearest human habitation and 5 miles from a main highway. Wholesale dumping of cats brought from larger cities was reported to be still a not uncommon practice.

Periodically each local association of sportsmen (for example, the Calaveras County Sportsmen's Association), if a member of the California Sportsmen's Association, is urged to file with headquarters a report of number and kinds of predators killed. A cup, plaque or some other such prize is awarded the local association which has amassed the most points for the period. Points allowed per predator kind are pro-rated in a ratio

directly proportional to the amount of damage a predator kind is supposed to do to game kinds and inversely proportional to the abundance of the predator. The following list of predators, with the point value of each kind, was copied from a "Predator Report" blank:

Mountain Lion	500	Water Snake	20
Bob Cat	100	Skunk	10
Coyote	100	Weasel	10
Wild House Cat	50	Ground Squirrel	10
Crow	50	Magpie (Bluebill)	10
White Pelican	50	Blue Jay	5
Horned Owl	20	Butcher Bird	5
Cooper Hawk	20	Field Rat	5
Sharp-shinned Hawk	20	Jack Rabbit	5

Founded on conversations with sportsmen at the conclusions of the two jay shoots I have attended, the following impressions are foremost: Interest in the shoot, as such, is waning, but will be revived. Whereas the jays were once killed primarily for the purpose of removing game predators, they are now sought principally for the pleasure derived from hunting, and *secondarily* because some benefit to "food game" kinds may result. In other words, jays have become game; they are hunted for the same more or less intangible reasons (exclusive of source of food) that other game kinds are sought, namely, physical and mental recreation, "sport of the chase," and joy of good fellowship and companionship.

Museum of Vertebrate Zoology, Berkeley, California, April 5, 1938.

THE NEED OF OAK-TREE INSECT-PEST CONTROL METHODS NON-DETRIMENTAL TO BIRD LIFE

By C. B. LASTRETO

Personal observation and experience have convinced me that current methods to prevent the defoliation of ornamental oak trees caused by the well-known caterpillar pest are ineffectual and are detrimental to bird (and other wild) life, even destructively so. For over a quarter of a century I have owned a six-and-a-half acre tract well covered with oak trees of three species, and half of it covered additionally with a thick growth of elderberry, toyon, madrone, and other trees, and snowberry, wild honeysuckle, wild rose, poison oak and other indigenous shrubs. At various times during that period, spraying was practiced on neighboring estates, while I too had it done on three or four occasions. In spite of all this the trees suffered, some much more so than others. When I did not have mine treated, I frequently observed, in a general way, that mine were better off than the others. Many other interested property owners concur, all of which confirms my conclusion that spraying methods have been ineffectual, at least very unsatisfactory.

There is no question that bird life in my oak belt neighborhood in Atherton, San Mateo County, California, both resident and migratory, has diminished during the period cited. There probably are other causes than spraying, but this almost certainly is at least one of them. The poison, diffused on treetops, into the atmosphere, and falling upon the ground and the covering vegetation, most probably kills more than the caterpillar; all the living beings that depend on the vegetation from the tree-leaves to the plants and grasses, ingest the poison as certainly as does the caterpillar. Probably other pupae, larvae, eggs, insects, etc., that are food for birds, having absorbed poison themselves, are lethal to the birds. In springtime, contemporaneous with the spraying and the breeding season, this is the more important and consequential.

Further evidence, of more scientific character, is presented in a report of Allen Frost, "Effect upon Wildlife of Spraying for Control of Gipsy Moths" (Journ. Wildlife Management, vol. 2, 1938, pp. 13-16). At a state park in New York, areas within and without the park and purposely well delineated by north-south lines and east-west boundaries, were set apart for controls. All the areas were surveyed before and at different times after the spraying with the same poisons generally used. In some areas sprayed there were no birds left; in the one least affected, a reduction of 50 per cent was noted; and in the others but one or two or three birds could be found. Evidence of like fatality to other wild life is also described, even to the observed exodus of snakes, which is indicative of other effects.

In the search for other remedies I have learned that a contact spray like that of nicotine or tobacco juice has a degree of efficiency when applied precisely at the time or times of the activity of the caterpillar; that it is not toxic; hence presumably does not poison directly and indirectly birds, mammals, or other insects that may be beneficial ones, bees for example; that it evaporates or volatilizes in a few days and leaves the vegetation unaffected. But it does have the objection of the impracticability of general opportune timeliness, as too late for the earlier larvae and too early for the unmetamorphosed ones and the escape of many in unreached spots.

Any process of spraying presumably has a disturbing effect on birds especially during the nesting period which is when most of the spraying is done; the parents are scared away, nests destroyed and nestlings possibly smothered.

Lamps illuminated at night and surrounded by electrocuting meshes do attract and kill moths in great quantities; but as Prof. W. B. Herms has found by experiment, the moth of the California oak worm (*Phryganidia californica*) has its idiosyncracy for an ultra violet light, practically invisible in the hours of dusk when it is on the wing. On a San Mateo estate this lamp and also one of mercury vapor were totally ineffective.

This leaves me at least with no means that I would other than condemn; all methods are inefficient and positively with no lasting effect. We much need some better process that may replace those which are all of them disastrous to bird life and even to other valuable life; and even though the oak trees do not perish nor probably even suffer from lasting injury, it is desirable for their sake to relieve them of this pest. And as it is, it will be understood why I disadvise spraying and do not myself do it.

San Francisco, California, April 15, 1938.

HIGHLIGHTS OF ORNITHOLOGICAL WORK IN UTAH

By WILLIAM H. BEHLE

Looking back over the published record of the ornithological work done in Utah, one is confronted with somewhat of an anomalous situation. Most of the known ornithological features of the area were discovered in the early days of exploration and survey. An annotated list of the birds of the then Territory of Utah was published as early as 1874, just 27 years after the arrival of the first colony of Mormon pioneers who entered the region for permanent settlement. Yet despite this early activity, there has been comparatively little advance made in the ornithological knowledge of this faunally attractive region since the decade of 1870. Of late there have been signs of a rennaissance in bird work in the state, however, so that it now seems desirable to summarize the work in ornithology that has already been done and so prepare the way for future intensive work.

In treating the sequence of events, the chronological order has been followed. Citations are included to the most important publications dealing with birds in Utah. I am indebted to Dr. Josselyn Van Tyne of the University of Michigan for bringing to my attention information relative to the chapters of the Agassiz Association in Utah.

The earliest references to the wild life of Utah are to be found in the accounts of itinerant missionaries and fur traders who traversed the region in the early part of the 19th century. These are for the most part casual observations and I have not been concerned with them in this attempt to trace out the really scientific work on the birds of the state. Likewise we may pass hurriedly over the varied accounts of the Mormon pioneers concerning the gulls from Great Salt Lake which saved in part the first crops of grain of the pioneers from the "Mormon crickets" (*Anabrus simplex*).

The unfortunate misunderstanding regarding the identity of the gulls involved has been to a certain extent cleared up (see Goodwin, 1905, and Bailey, 1905); but even of recent years in certain texts the Franklin Gull, *Larus franklini*, is given the credit rather than the California Gull, *Larus californicus*, which latter is the species that nests in such great numbers on the islands in the Great Salt Lake. (See Behle, 1935.) It should be remembered in this connection, though, that there is a colony of nesting Franklin Gulls in the state, located at the mouth of the Bear River as it enters Great Salt Lake.

Our attention first focuses, then, on the naturalist activities of the early government expeditions for exploration and survey. In the John C. Fremont report of 1845 there is mention of certain birds in the Great Salt Lake region, observed there in the early fall of 1843. Although collections of geological and botanical materials were made on Fremont's first and second expeditions, to which the above cited report refers, apparently no birds were saved, for there is no accompanying scientific report on birds nor is there any reference in the text that I can find stating that bird specimens were saved. The ornithological observations of interest to us are contained in the account of Fremont's daily journal and apply for the most part to conditions at the extensive marsh area at the mouth of the Bear River.

In the fall of 1843 the party followed the Bear River to its mouth at Great Salt Lake, and a few members including Fremont himself and Kit Carson even navigated out in an India-rubber boat to what is now known as Fremont Island, in Great Salt Lake. Under date of September 3, when encamped near the overflows at the mouth of the Bear River, Fremont recorded that "the water fowl made this morning a noise like thunder. A pelican (*pelecanus onocrotalus*) was killed as he passed by, and many geese and ducks flew over the camp." At the overflows at the mouth of the river he found that "The whole morass was animated with multitudes of water fowl, which appeared to be very wild—rising for the space of a mile round about at the sound of a gun, with a noise like distant thunder. Several of the people waded out into the marshes, and we had tonight a delicious supper of ducks, geese, and plover." One night the party had a supper of "sea-gulls," which Carson killed near the lake. These observations are significant for they give us our first mention of that important marsh area which is now the famous Bear River Migratory Bird Refuge.

The first government expedition which paid especial attention to the natural history of the Utah region apparently was the Stansbury expedition to the shores of Great Salt Lake in 1849-50. This expedition was organized under orders of Colonel J. J. Abert for the purpose of making "a survey of the Great Salt Lake, and an exploration of its valley." The party, under command of Captain Howard Stansbury, left Fort Leavenworth on May 31, 1849, arriving at the City of the Great Salt Lake on August 28, 1849. They wintered at Salt Lake City. The lake was surveyed in the spring of 1850 and the company departed from the region August 28, 1850.

No naturalist accompanied the party, as far as I know, but nevertheless, natural history specimens were taken which were of great importance. The birds were deposited in the United States National Museum and were reported on by Spencer Fullerton Baird in appendix C of Stansbury's Report which first appeared in 1852. Thirty-one species are listed, many of which were only sight records, however. Notations on abundance were frequently given and it is notable that the great majority of the species mentioned are water birds. They were all taken in Salt Lake Valley and mostly in the spring of 1850. Baird wrote in the preface to his report that no government expedition since the days of Major Long's visit to Missouri had ever presented such important additions to natural history.

One or two items in the Stansbury and Baird reports are worthy perhaps of special comment. Among the land birds brought back was a specimen of the Mountain Bluebird, *Sialia currucoides*. This was thought at the time by Baird to be a new species and was accordingly described as *Sialia macroptera*. The second specimen of *Leucosticte* known to science was the one taken by some member of the party in Salt Lake Valley, March 21, 1850. The Cinnamon Teal shot on the Jordan River comprised the second record for the species from North America at that time. In addition to the formal report of Baird there is contained in the daily accounts of Stansbury's journal the first descriptions of the colonies of gulls, pelicans, cormorants and herons on the islands of Great Salt Lake (see Behle, *op. cit.*, p. 29).

Three years following the return of the Stansbury expedition, another government exploration and survey party entered Utah Territory and contributed in a small way to the knowledge of the ornithology of the region. This was one of the Pacific Railroad surveys and more pertinent ornithological results probably would have resulted had it not been for the tragic death of many of the party including the leader and the naturalist of the expedition. The expedition to which I refer was the Gunnison-Beckwith party of 1853-54. The expedition was commissioned to make a "survey of the pass through the Rocky mountains, in the vicinity [*sic*] of the headwaters of the Rio del Norte [Rio Grande], by way of the Huerfano river and Coo-che-to-pa, or some other eligible pass, into the region of [the] Grand and Green rivers, and westwardly to the Vegas de Santa Clara [Santa Clara River, southwestern Utah] and Nicollet river [Sevier] of the Great Basin, and thence northward to the vicinity of Lake Utah on a return route, to explore the most available passes and cañones [*sic*] of the Wahsatch range and South Pass to Fort Laramie."

As to personnel, there was Captain J. W. Gunnison in charge, assisted by First Lieutenant E. G. Beckwith. The military escort was composed of some 30 non-commissioned officers and men. F. Kreuzfeldt served as botanist, probably collected some birds and presumably was assisted in collecting by Dr. James Schiel, surgeon and geologist.

The members of the group left their preparatory encampment near Fort Leavenworth on June 23, 1853. By September 29 they had entered the present confines of Utah, having come down from the divide separating the waters of the Grand and Green rivers. They crossed the Green River probably at the ford near the present town of Greenriver, Utah. Having come upon the Old Spanish Trail they followed along it or in its general direction westwardly through Wasatch Pass and Salina Canyon to the Sevier river. Sevier Valley was entered, October 17. Captain Gunnison, Kreuzfeldt and a few others pushed on toward Sevier Lake ahead of the main party and were massacred by Pavant Indians on October 25. Following this tragic affair, Lieutenant Beckwith assumed charge of the expedition which wintered in Salt Lake City. A spring trip was made to Fort Bridger and return to the winter base. Then with new orders the party continued across the Great Basin to explore new routes over the Sierra Nevada.

Beckwith's account of the expedition appears in the second volume of the Pacific Railroad Reports issued in 1855. However, Baird's report on the birds collected was not printed until 1859 and then appeared in volume 10 of the railroad reports (Baird, 1859). Certain specimens are listed from Salt Lake City indicating that some member of the party collected specimens even after Mr. Kreuzfeldt's death. Of the species listed, only 7 as near as I can ascertain, were taken in Utah as outlined today. Of these, the Raven, Mud-hen, Red-head, and Golden Eye are listed for the first time from the state. The others had previously been recorded by Stansbury. Baird's report on the birds of the Gunnison-Beckwith survey comprises the second published scientific account dealing with birds in Utah.

"Johnston's Army" of the United States government entered the valley of the Great Salt Lake on the 26th of June, 1858, under the command of Colonel Albert Sidney Johnston. Permanent camp (Camp Floyd) was made at Fairfield, Utah, where at least part of the army remained until 1861. At various intervals during the army's sojourn at Camp Floyd, Captain J. H. Simpson made several surveying trips to surrounding areas. His most notable expedition was made in 1859 for the exploration of a direct wagon route from Camp Floyd to Genoa in Carson Valley, Nevada. Henry Engelmann served under him as geologist, meteorologist and botanical collector; Charles S. McCarthy was the taxidermist. The Genoa expedition left Camp Floyd, May 2, 1859, returning August 4 the same year. The report of this survey was not printed, however, until 1876. As a part of this report, there is in appendix C a list of identifications by Baird of all the birds taken by McCarthy, not only on the Genoa trip but also from various points in Utah. For many specimens the locality was simply designated as "Utah." Thus many of those so marked may have actually been taken outside the present confines of the state. The only distinctive thing about the bird collections known to have been taken definitely from within Utah as outlined today, is again the preponderance of water birds. Most were taken at Utah Lake, but a few are from Camp Floyd, evidently having been collected on the pond there formed by the large spring that gushes forth in the midst of a desert area.

Perhaps the most intensive work on birds ever done in the state was that of Robert Ridgway while he was serving as Zoologist for the King expedition for the geological exploration of the 40th parallel. The first camp of this survey was established June 6, 1867, at Sacramento, California. The winter of 1867 was spent in Carson City, Nevada, and vicinity. The group worked eastward the following summer of 1868. The first locality in Utah where collections of birds were made was Deep Creek, Tooele County, which was reached on October 5. The winter of 1868-69 was spent at Salt Lake City and in the vicinity. On May 20, 1869, spring collecting was begun by Ridgway at Salt Lake City and continued until June 21 when camp was moved to Parley's Park, about twenty-five miles east of Salt Lake City near the present Park City. In the meantime, Antelope, Stansbury, and Carrington islands in Great Salt Lake had been visited. On July 2, Ridgway made an excursion in company with the botanists of the expedition eastward to the western spurs of the Uintah Mountains (Pack's Cañon). A return route was made to the Parley's Park base camp via Provo Cañon, Utah Lake and Salt Lake City. Work was continued at Parley's Park until August 16 when collections, notes and specimens were packed and field work ended.

Three publications relating to the ornithology of this expedition resulted. "Notes on the bird-fauna of the Salt Lake Valley and adjacent portions of the Wahsatch Mountains" was published in 1873 (Ridgway, 1873). "Lists of birds observed at various localities contiguous to the Central Pacific Railroad, from Sacramento City, California, to Salt Lake City, Utah" appeared the following year (Ridgway, 1874). Then finally

there was the main ornithological report published in 1877 which comprised part 3 of volume 4 of the general report of the expedition. Results pertaining to the birds of Utah are particularly important. During the months of May and June, 107 species were noted in the vicinity of Salt Lake City. At Parley's Park 116 species were found, and 21 at Pack's Canyon in the Uintah Range. Ridgway thus had opportunity to compare the montane avifauna with the desert one. His observations were made during the breeding season and so tied in nicely with the autumn observations of Allen, Nelson and others who collected in Utah during the subsequent few years. Ridgway's work was particularly valuable because of the natural history, habitat and distributional notes recorded. Heretofore the information recorded about the birds of Utah had consisted mostly of mere records of occurrence.

In the spring of 1871 an expedition to the "Great Plains and the Rocky Mountains" was sent out by the Museum of Comparative Zoology. J. A. Allen was in charge of the party. He was accompanied by C. W. Bennett as taxidermist, and Richard Bliss as ichthyologist. Both of these men aided in the ornithological work, especially Bennett. The party ultimately reached Ogden, Utah, and collected in that vicinity from September 1 to October 8, 1871. The ornithological results of this expedition are found in a resumé article in the American Naturalist (Allen, 1872*a*) and in a final ornithological report which not only included an annotated list of birds from Ogden and each of the other places where stops were made, but also a general annotated summary list for the whole expedition was included.

In Utah, although Odgen was the principal field of operations, several excursions were made by Allen to the neighborhood of Salt Lake City and to different points along the eastern shore of Great Salt Lake. The region thus covered embraced the northeastern portion of the valley of the Great Salt Lake, including a portion of the lake shore near the mouth of the Weber River, the lower portion of the Weber Valley, Ogden Canyon and the mountains north and east of Ogden. Allen's annotated list for Ogden contains 137 species collected or observed by Bennett or himself during their five weeks there. In the report one finds emphasized the great variety of environmental conditions, which explanation was offered to account for the rich avian fauna. Habitats mentioned were the lake with its marshes, the flat valley and the abruptly rising mountains with alpine regions. He spoke of an increase in the number of small birds, especially the graminivorous, insectivorous and frugivorous types as the result of the settlers' activities of transforming arid plains to farms with orchards and shade trees. Three species were reported to have been recently introduced, the English Sparrow, the California Quail and the eastern Quail or Bob-white. The first two are abundant today in Salt Lake Valley; the Bob-white does not seem to have survived.

In the month of June, 1872, C. Hart Merriam was engaged in ornithological work in northern Utah and southern Idaho, holding a position as ornithologist to the Hayden Geological Survey. For the year 1872, Merriam was attached to the Snake River division of the expedition, and in Utah he collected at Salt Lake City, Ogden, and along the Bear River. His collecting took place from June 5 to June 21. The survey began its labors near Ogden and most of the specimens taken in Utah were from Ogden and vicinity. Merriam's report (1873) was a part of the main report of the expedition appearing in 1873. At the end of the report of his ornithological activity in 1872, Merriam included a list without annotations of all the birds known to occur in Utah Territory. In this first list of Utah birds to be published, 176 kinds were included. Some of them, however, were based on information furnished by Ridgway, Allen and Henshaw.

The most prominent ornithological work in the state was that connected with the Explorations and Surveys west of the One Hundredth Meridian in charge of George M.

Wheeler. Although field work for the Wheeler Survey commenced in 1869, natural history work was not emphasized until the expedition of 1871. Work that year was centered mainly in Nevada and Arizona, and no birds are listed for Utah in the reports for the expedition of 1871. The following year the expedition worked almost entirely in Utah, with notable ornithological results. Naturalist activities were in charge of H. C. Yarrow with Henry W. Henshaw as assistant. The expedition for 1872 was organized at Salt Lake City. While the various field parties were assembling, the two naturalists moved south on July 22, about 50 miles to Provo which, because of its proximity to Utah Lake on one side and the mountain canyons and streams on the other, together with the orchards and cultivated fields, proved to be a good collecting area. Two weeks were spent here, then the two ornithologists departed to accompany two separate parties to different parts of the state. Yarrow apparently joined Lieutenant Hoxie's party which took a westwardly route to Fairfield and across the southern limit of the American Desert to extreme eastern Nevada, thence southeast to Fillmore, Utah. From Fillmore, the route was southward, thence eastward across the mountains at Fremont Pass, some 15 miles southeast of Beaver, to the eastern valley of the Sevier River which was followed south to Panguitch. From Panguitch the group traveled south and west to the Virgin River and the rendezvous camp at Toquerville.

The other party to which Henshaw was attached and which was under the leadership of Lieutenant Wheeler followed an easterly course from Provo to Strawberry Valley, thence south to Thistle and Sam Pitch (San Pete) Valley; south through Grass Valley, presumably to a point about ten miles north of Panguitch, from which locality they turned westward through Fremont Pass, coming out about 20 miles north of Parowan. Thence they journeyed south to Toquerville. At Toquerville the two collectors, again together, organized a minor party for naturalist activities. Under Yarrow's leadership the group proceeded south to Saint George, then west and north to Pine Valley, east to Harmony, north to Beaver and finally back to Provo where additional time was spent collecting until the entire expedition returned to Salt Lake City. Here it disbanded in December. Thus about six months were spent in the field and some 600 birds were collected in Utah. These represented 165 species, and a considerable portion of the state was covered. Among the specimens collected was the skin of a titmouse later designated by Ridgway (1882, p. 344) as the type of *Lophophanes inornatus griseus*. Henshaw (1919, p. 177) in his autobiographical notes gives an account of the life of the collectors on this expedition, the routine of collecting, and the equipment used.

The published results of the ornithological work of Yarrow and Henshaw are the most important treatises on the birds of Utah even today. An annotated distributional list of the birds of the state was compiled by Henshaw following his work in 1872. This was first read before the Lyceum of Natural History, New York, on April 6, 1874, and was published in the Annals of the Society (Henshaw, 1874). It was reprinted the same year with a few minor changes as a government publication. The pamphlet (Yarrow and Henshaw, 1874) in which the annotated list appears, also gives the ornithological results of the Wheeler expeditions for 1871, 1872 and 1873, and was issued in advance of the main report for the purpose of making the ornithological findings known considerably earlier than they would otherwise have appeared. Essentially the same material for Utah is contained in the main report (Henshaw, 1875).

In Henshaw's annotated list of the birds of Utah he notes 214 species. Of these, 160 were either seen or actually taken by Yarrow or Henshaw in 1872. Twenty-five others not encountered by them were found by Allen for the Ogden region. The others were records of Ridgway who furnished Henshaw with a list of his observations. The seasonal status was indicated, if known, in the list, and the authority for the records was

given and also the places of occurrence. This list is the highlight of Utah ornithology even today.

Quite coincidentally, while Henshaw and Yarrow were collecting around Provo, E. W. Nelson was collecting birds in the vicinity of Salt Lake City. He had been assisting Professor E. D. Cope in paleontological work in Wyoming, and at the conclusion of that project Nelson traveled across the Great Basin to California with a companion, W. W. Wentworth. They collected birds and made observations near Salt Lake City from July 27 to August 8, 1872. Their collecting was done at the mouth of the Jordan River and thence north ten miles along the lake shore and from there eastward over cultivated land to the base of the mountains. Observations were made on 41 species. Water birds figure prominently among these. An account of Nelson's collections and observations was later published (Nelson, 1875).

After the great activity in bird work in the region from 1869 to 1872 there was a lull in government expeditions which entered Utah and which were concerned with natural history work. Indeed, only one other large government expedition did ornithological work in the state and that was not until 1891. In the decade commencing with 1880, however, we find apparently the first manifestation of local ornithological interest. This was the formation of several Salt Lake chapters of the Agassiz Association which was a nation-wide organization at the time for the study of birds and wild-life. Quoting from the first volume, number one, November, 1885, of the Agassiz Notes, published in Salt Lake City, there is the following historical note. "The first Agassiz Chapter formed in Salt Lake began work August 1, 1882, under the name of Chapter 'A'. In the following year Chapters 'B' and 'C' were organized. Chapter 'A' existed till May, 1884, and then disbanded; Chapter 'B' continued about a month, and also disbanded; Chapter 'C' ran about a year and a half, then adjourned and has not met since. On November 1, 1884, some of the old members of 'A' and 'C' met at the residence of Professor M. E. Jones, and organized this Chapter under the name of Chapter 'D', but Mr. H. H. Ballard, the President of the Agassiz Association, not wishing to multiply nominal chapters in the city, thought it best for us to take the name 'A' reorganized. We have now seven active, two corresponding, and one honorary member. Hoping to awaken an interest in Natural Science we have determined to publish this pamphlet." Several articles on Utah birds are included in this publication, none particularly important.

In 1891, members of the Death Valley Expedition of the United States Biological Survey were carrying on field work in the Death Valley region of California. Two members of the party made a side trip in the spring of 1891, which took them into southwestern Utah where many valuable observations were made on Utah birds and many specimens were obtained. C. Hart Merriam and Vernon Bailey were the two ornithologists making this side trip into Utah and their travels took them to the valley of the Virgin River as far as St. George. Then they journeyed north as far as the Escalante Desert. Localities in Utah where birds were observed or collected included the Beaver Dam Mountains, Santa Clara Valley, St. George, Diamond Valley, Shoal Creek, Mountain Meadows, and the Escalante Desert. The records of occurrence and distributional notes obtained are included in A. K. Fisher's report on the ornithology of the Death Valley expedition (1893).

During the last quarter century, there have been a number of active and enthusiastic oölogists in Utah who have studied birds in the state and who have made collections of Utah birds or eggs. Their interest centered on birds mainly from the standpoint of pursuing hobbies, rather than from a basic scientific interest. Nevertheless, many worthwhile data have resulted from the activities of this group. Among the better known of these ornithologists and oölogists were John W. Sugden and his son Dr. John W. Sug-

den, O. H. Howard, Mr. and Mrs. A. O. Treganza, D. Moore Lindsay, J. Walcott Thompson, Ashley D. Boyle, J. A. Mullens, S. H. Goodwin, J. H. Paul, Harry Aldous, M. R. Cheeseman, and Claude T. Barnes.

Common interests brought many of these men together and they decided to organize a bird society. Accordingly, on December 27, 1912, the Utah Audubon Society came into existence with Claude T. Barnes, President, J. H. Paul, Vice-President, Walter Cluff, Secretary, and N. W. Reynolds, Treasurer. Many of the others listed above were trustees. This organization functioned actively for many years before interest tended to die out. Of recent years a reorganization has taken place under the guidance of Dr. A. M. Woodbury and C. W. Lockerbie. This new Utah Audubon Society comprises today the one active body of ornithologists in the state.

Also out of the socialization of the oölogists grew a chapter of the Cooper Ornithological Club. The local group sent a petition to the parent Pacific Coast organization requesting permission to establish an Intermountain Chapter of the Club. The request was granted by unanimous vote of both divisions of the Cooper Club and the first meeting of the new chapter was held September 14, 1915. Dr. D. Moore Lindsay was the first president. Meetings were held regularly and the minutes were printed in the Condor until 1918. The organization then experienced a period of inactivity. For a brief time in 1919, minutes of meetings were sent in. Gradually the meetings merged with those of the Audubon Society, since the officers of the two societies were the same. No minutes of the meetings of the Cooper Club chapter were submitted after 1920, although the group continued to meet sporadically up to a few years ago, when the organization seemed to disband entirely after the death of John W. Sugden who was the dean of the group.

Today great interest is centered on the status of the pelicans, cormorants and other water birds that nest on certain of the islands of Great Salt Lake. Changing environmental conditions resulting in change in habits of the birds make this a most interesting point of attention. The Bear River Migratory Bird Refuge, which was established after the disastrous duck sickness of the period centering about 1915, is a significant arena of scientific study and information. The state with its diversified topography is an attractive area for the study of bird distribution. The lack of such information on Utah birds is keenly felt among systematists at large and by local, interested students. It is hoped that there will soon appear a publication on the birds of Utah. Ornithologists at the University of Utah are gathering data for such a publication.

LITERATURE CITED

Allen, J. A.
1872*a*. Ornithological notes from the West. Amer. Nat., vol. 6: III. Notes on the birds of the Great Salt Lake Valley, pp. 394–404.
1872*b*. Notes of an ornithological reconnoissance of portions of Kansas, Colorado, Wyoming, and Utah. Bull. Mus. Comp. Zool., vol. 3, pp. 113–183.

Bailey, V.
1905. A correction. Condor, vol. 7, p. 82.

Baird, S. F.
1852. Birds. Exploration and survey of the valley of the Great Salt Lake of Utah, by H. Stansbury. (Philadelphia, Lippincott, Grambo and Co.), pp. 314–335.
1859. Report on birds collected on the survey. Pacific Railroad Reports, vol. 10, pp. 12–16, pls. 12–15, 17.
1876. List of birds collected by Charles S. McCarthy, taxidermist. Rept. Expl. across the Great Basin of the Terr. of Utah . . . in 1859, by Captain J. H. Simpson. Pp. 377–381.

Behle, W. H.
1935. A history of the bird colonies of Great Salt Lake. Condor, vol. 37, pp. 24–35, map.

Fisher, A. K.
1893. Report on the ornithology of the Death Valley expedition of 1891, comprising notes on the birds observed in southern California, southern Nevada, and parts of Arizona and Utah. North Amer. Fauna No. 7, pp. 7–158.
Fremont, J. C.
1845. Report of the exploring expedition to the Rocky Mountains in the year 1842, and to Oregon and north California in the years 1843–'44. (Washington, Gales and Seaton, printers), 693 pp., 22 pls., 5 maps.
Goodwin, S. H.
1905. About the Utah gull. Condor, vol. 6, pp. 99–100.
Henshaw, H. W.
1874*a*. An annotated list of the birds of Utah. Ann. Lyceum Nat. Hist. of N. Y., vol. 11, pp. 1–14.
1874*b*. An annotated list of the birds of Utah. Rept. upon ornithological specimens collected in the years 1871, 1872, and 1873. Geog. and Geol. Expl. and Surv. West 100th Mer., George M. Wheeler. Pp. 39–54.
1875. Report upon the ornithological collections made in portions of Nevada, Utah, California, Colorado, New Mexico, and Arizona during the years 1871, 1872, 1873, and 1874, by H. W. Henshaw. Rept. Geog. and Geol. Expl. and Surv. West 100th Mer. by George M. Wheeler. Vol. 5, pp. 131–507, 977–989, pls. 1–15.
1919. Autobiographical notes. Condor, vol. 21, pp. 177–181.
Merriam, C. H.
1873. Report on the mammals and birds of the expedition. [Hayden's, of 1872, which surveyed portions of Montana, Idaho, Wyoming and Utah]. Sixth Ann. Rept. U. S. Geol. Surv. Terr. for 1872, 1873. Pp. 661–715.
Nelson, E. W.
1875. Notes on the ornithology of Utah, Nevada and California. Proc. Boston Soc. Nat. Hist., vol. 17, pp. 338–365.
Ridgway, R.
1873. Notes on the bird-fauna of the Salt Lake Valley and the adjacent portions of the Wahsatch Mountains. Bull. Essex Inst., vol. 5, pp. 168–173.
1874–1875. Lists of birds observed at various localities contiguous to the Central Pacific Railroad, from Sacramento City, California, to Salt Lake City, Utah. Bull. Essex Inst., vol. 6, pp. 169–174; vol. 7, pp. 10–24, 30–40.
1877. Ornithology, *in* "Ornithology and Palaeontology," U. S. Geol. Expl. Fortieth Parallel, vol. 4, part 3, pp. 303–669.
1882. Descriptions of some new North American birds. Proc. U. S. Nat. Mus., vol. 5, pp. 343–346.
Yarrow, H. C., and Henshaw, H. W.
1874. Report upon and list of birds collected by the expedition for explorations west of the one hundredth meridian in 1872; Lieut. Geo. M. Wheeler, in charge. Rept. upon ornithological specimens collected in the years 1871, 1872, and 1873. Geog. and Geol. Expl. and Surv. West 100th Mer., George M. Wheeler. Pp. 5–38.

Museum of Vertebrate Zoology, Berkeley, California, July 12, 1937.

BIRD LIFE IN NEVADA WITH REFERENCE TO MODIFICATIONS IN STRUCTURE AND BEHAVIOR

By JEAN M. LINSDALE

No doubt many readers of the *Condor* have traveled across the state of Nevada, either by way of a transcontinental railroad line or by one of the main automobile highways. Whatever the route, I suspect that the most vivid impression was of barrenness and desolation. Indeed, the comment I have heard most often, when bird life in Nevada was mentioned, has been that "no birds live there." Sometimes, I have been told by persons who had lived for a long time in the state that only one or two kinds of birds lived in their neighborhood. Even naturalists have remarked that they considered Nevada a place characterized by absence of animal life and especially of birds. It is little wonder that, although more than eighty persons have done some bird work in the state, scarcely anyone has resided there for long who observed birds in serious fashion.

My first bird trip to Nevada was made about ten years ago, and since then I have returned many times and have paid much attention to the problems of bird life pertinent to that region. This remains one of the last large areas in the country the avifauna of which is little known. Most compilers of state lists of birds are able to invite special interest for their state on account of the "abundance and variety" of its bird life. No such claim can be made for Nevada; the chief interest in its bird life results from the sparseness of population. It is a population composed of relatively few species, considering the large size of the area. This very circumstance makes this to me a place of exceptional interest for bird study. The scattered representatives of most of the species make it impossible to predict where in the state any given kind of bird will occur. A bird cannot be considered as present in any locality without actually finding it there. The same kind of uncertainty applies to the seasonal status of each kind of bird.

In discussing the bird life in Nevada I intend to consider only a few general topics. These are the physical characteristics of the area which in some way affect the avifauna, some of the ways in which birds have responded structurally to the geographic conditions there, and the more striking responses they have made in behavior to the desert environment of the Great Basin.

Nevada ranks sixth among the states in size; it is seven-tenths as large as California. Of its seventy million acres, barely four million are in farms and fewer than five hundred thousand are under irrigation. The area considered forest is approximately five million acres, but not much of this is covered with timber, and everywhere the trees are scattered. In general, this state is a high plateau, 4000 to 6000 feet above sea level. At the southern tip it drops abruptly down to the Colorado River which leaves the boundary at about 500 feet altitude. On the plateau are many mountain ranges, some of them 100 miles long and 9000 to 11,000 feet high. Several peaks are around 13,000 feet high. The ridges are nearly parallel and mostly run north and south. They are sharp and narrow, being separated by narrow, level-floored valleys. The only large east and west valley in the state is the one through which the Humboldt River flows. North of this the mountainous area is broken by many low passes and it constitutes the divide between the Humboldt and the branches of the Snake River.

Nearly all the rivers in the state empty into lakes which have no outlets, or they lose their water by absorption and evaporation as they spread out over the floors of the valleys. Many of the valleys are closed drainage systems with no stream channels and are so inclosed by mountains that they would hold large lakes before overflowing. They characteristically have playa lakes in their centers in years of extra rainfall or snow.

A consideration of climate is important in any distributional study of birds. The most striking climatic features of Nevada are its bright sunshine, small annual rainfall in the valleys and deserts, heavy snowfall in the higher mountains, dryness and purity of the air, and exceptionally great diurnal ranges in temperature. Reno, at 4500 feet, has temperature near the average, with an annual mean of 50 degrees. In summer, maximum temperatures near 100 degrees occur at many places, especially in the south. Lowest winter temperatures are in the northeast. The temperature goes below zero everywhere except in the extreme south.

The length of the growing season varies greatly, but it averages from seven to eight months in the extreme south and from two to five months in most other localities. In the north, frost may occur in any month of the year, but the last killing one usually comes about June 1. The first killing frost in autumn usually occurs in the first half of September in the north and northeastern parts of the state, but not until November in the south.

Average annual precipitation for the Nevada section is 9.02 inches. The wettest year (1906) had an average for all the stations of 15.87 inches; the driest (1928), 4.87 inches. January has the greatest precipitation, and August the least. The eastern slope of the Sierra Nevada receives the greatest annual precipitation, and the lowest part of the plateau area, just east of the Sierra and southward to the edge of Death Valley, receives the least. The number of days per year with 0.01 inch or more of precipitation varies from 14 at Clay City, southern Nye County, to 67 at Tahoe. At Marlette Lake the annual snowfall is 255 inches while at Logandale, Clark County, it is less than one inch. Evaporation at Clay City, on the eastern edge of Death Valley, averages more than 11 feet of water per year.

The prevailing winds are from the south, southwest, and west. Wind velocities are generally light, and severe wind storms occur only at rare intervals. In the average year there are 193 clear days, 87 partly cloudy days, and 85 cloudy days. At Reno the average percentage of possible sunshine is 74.

I recite all these facts concerning Nevada, not for any interest they may arouse in themselves, but because I believe they are important among the circumstances which determine what set of bird species will inhabit the area, which govern to some extent the structural characters of those birds, and which influence profoundly the habits and behavior of the birds. The search for the manner of these responses by the birds to their surroundings accounts for my interest in the bird life in Nevada.

Within this large district, extending five hundred miles between 35 degrees and 42 degrees north latitude and more than three hundred miles between 114 degrees and 120 degrees west longitude, we find enough bird problems to hold our attention for a long time. Although some progress has been made in cataloging the kinds which occur there and in mapping records of their occurrence, scarcely a start has been made in interpretation of their responses to the conditions I have just outlined.

A general review of the avifauna of Nevada shows approximately 340 species and subspecies that may be considered as members of the Recent avifauna of the state. Of these I have examined skins of 315 kinds—24 per cent as many as are in the 1931 check-list of the American Ornithologists' Union. Of the remaining 25 kinds some have been collected, but for the most part they are known from the state on the basis of sight records. A list of kinds whose status is hypothetical includes 14 birds. Of the birds in the main list there are 276 full species, or 37 per cent as many as are included in the A. O. U. Check-list.

When the whole list is analyzed on a basis of seasonal occurrence, it can be divided approximately into the following proportions: Permanently resident, 42 per cent; summer resident, 30 per cent; winter visitant, 12 per cent; transient, 9 per cent; accidental or irregular, 5 per cent; extinct, 1 per cent. The species in the last group are the California condor and the sharp-tailed grouse. These percentages can be only approximate on account of the meager information concerning many of the species.

Within the state of Nevada thirty-seven bird species change sufficiently in structural characters to be represented by more than one recognizable breeding race. In some of these only two such geographical races have been distinguished; in a few at least three are present; one has four. This group of species includes seven non-passerine and thirty passerine kinds. The non-passerine ones are: dusky grouse, screech owl, great horned owl, red-breasted sapsucker, Williamson sapsucker, hairy woodpecker, and downy woodpecker. All these are characterized by discontinuous distribution. In each there is decrease in size toward the south and the largest individuals are in the northeast corner of the state where also white coloration is conspicuous in the plumage.

The rest of the geographically variable species are all in the single order, Passeriformes. They are therefore fairly closely related. They are all small birds and are generally represented in collections by extensive material. Hence they may be considered in the present analysis with considerable assurance and on basis of a large amount of factual detail. Special effort has been made to procure skins to represent all parts of the state and at seasons when they would be most significant.

The following paragraphs summarize the geographic variations detected in Nevada specimens of these variable passerine species.

Horned lark: numerous in valleys; three races; darkest in northwest part of state; palest toward the east.

Crested jay: sparse on a few mountains in extreme western, eastern and southern parts of state; three races; no intergradation in this area; southern and eastern races paler.

California jay: present on most of the mountain ranges; two races; larger and grayer toward east; large bill in northwest.

Mountain chickadee: resident in the mountains; two races; race in northwestern part darker and smaller.

Gray titmouse: present on many juniper-piñon-covered mountains; two races; large bill in northwest; gray toward east.

White-breasted nuthatch: resident on many mountain ranges; two races; extremely long slender bill over most of state; short stubby bill in extreme east.

Pigmy nuthatch: scarce, on a few mountain ranges; two races; southern one paler and grayer.

Brown creeper: present on a few mountain ranges; three races; increase of gray coloration toward east and south.

Bewick wren: scarce, but widespread in state; two races; grayer and larger toward southeast.

Long-billed marsh wren: numerous in marshy places; two races; Colorado River race darker than one on plateau.

Hermit thrush: common on higher mountains; three races; larger and grayer toward east.

Olive-backed thrush: present in larger mountain ranges; two races; grayer toward east.

Western bluebird: scarce in eastern and western sections; two races; western race with blue on back, eastern with back wholly chestnut.

Loggerhead shrike: frequent in valleys and flats; two races; birds near Colorado River differ from those on plateau in being larger and grayer.

Bell vireo: restricted to small areas on Colorado River and Ash Meadows; two races; Colorado River birds more greenish and smaller.

Blue-headed vireo: present on mountains in western and eastern sections; two races; eastern birds grayer.

Orange-crowned warbler: present on several mountain ranges; two races; eastern birds with larger size and duller coloration.

Yellow warbler: frequent in vegetation bordering streams; three races; larger size and heavier streaks toward east.

Audubon warbler: common on the timbered mountains; two races; larger size and more extensively black toward east.

Yellow-throat: frequent in marshy areas; two races, one on plateau grayer and one in southern part of state greener, brighter, coloration more distinct and bill larger.

Pileolated warbler: present on several mountain ranges; two races; larger and duller toward east.

Red-winged blackbird: numerous in marshy places over whole state; three races; long slender bill toward northwest and south; heavy, short bill in east; female paler toward east and south.

Cowbird: frequent in the valleys; two races; larger on the plateau, with longer and more slender bill, female paler; Colorado River race small, with stubby bill, and female darker.

Blue grosbeak: scarce near Colorado River and part way north in the state; two races; Colorado River birds have larger bills.

Crossbill: irregular on higher mountain ranges; two races; larger and paler toward east.

Spotted towhee: common in lower parts of mountains; two races; heaviest bill in northwest corner; longer wing and tail and paler coloration toward east.

Sage sparrow: numerous in valleys and flats; two races; smaller and grayer toward southwest.

Junco: common on many mountain ranges; three races; grayer toward east; no intergradation with Sierran race, unless on Charleston Mountains.

Fox sparrow: common on several mountain ranges; four races; largest bill toward west, brown toward north, grayest and smallest at south.

Song sparrow: common along streams; three races; large bill toward northwest, grayer toward east, Colorado River birds extemely pale.

When these items are analyzed, it becomes evident that several general principles are involved in them. In the first place many of these variable species are ones which are not uniformly common across the area. Sometimes the populations are separated by hundreds of miles of uninhabited territory. The breaks in range, however, coincide with observed changes in structure. This change from one discernible race to another takes place repeatedly, but not always, in certain narrow belts of territory. Some such districts in Nevada may be designated as follows:

(1) The eastern base of Sierra Nevada, which marks the eastern limit of many species and races.
(2) The boundaries of the old Lahontan Lake basin, which coincide closely with ranges of some geographic races of birds.
(3) The high mountain ranges in the northeastern and eastern parts of the state, which mark the western limits of certain Rocky Mountain species and races.
(4) The southern margin of the high plateau, which probably is more generally a boundary to ranges of species than of geographic races.
(5) The immediate vicinity of the Colorado River, which is inhabited by several distinctive species and races.
(6) The northeastern extension of the Mohave Desert, which extends over the western boundary of the state, and which brings in at least three races of birds.

The structural characters most often concerned in the geographic changes noted are the bill, which usually becomes shorter and stubbier toward the east and smaller toward the south; the wings and tail, which generally are longer toward the east; and general coloration, which becomes paler and distinctly grayer toward the east, and sometimes brighter and darker in the vicinity of the Colorado River.

The recurrence of the same sort of change in many species seems to indicate that the environment is effective in causing the change in some way additional to the single factor of isolation. Some observations support the view that some of these changes in structure have adaptive value. It seems likely that lengthened wing and grayness of coloration, at least, may be explained on this basis.

In taking up the problem of the responses birds make in behavior to this desert environment I shall refer to the results of a study made in the region of the Toyabe Mountains, a high mountain range in central Nevada which with the adjacent valleys contains habitats representative of much of the Great Basin. The efforts of five persons on 321 days in this area between 1930 and 1933, provided a large accumulation of field notes, photographs, plant specimens, and about 2500 specimens of vertebrates. Emphasis was given to the study of species as units in the whole fauna, and especially to the responses of each kind of animal to its environment and to other animals. In all, 215 kinds of vertebrates were studied, including 3 amphibians, 13 reptiles, 152 birds, and 47 mammals. Most attention was given to the birds.

A point may be raised as to the reason for going to a remote locality to study processes which take place wherever vertebrates occur. The explanation lies in the circumstance that in the high desert mountain ranges of the central Great Basin many of the environmental conditions which are suspected of affecting these animals are present in apparently extreme form. In such severe surroundings it was anticipated that more examples of environmental control of vertebrates could be observed in a short time than in a more equable region. More species and individuals here probably are living near their limits of toleration as regards one or more of their environmental influents than in other regions in the United States.

Factors which influence the distribution of vertebrates must be of the same kinds which affect the daily routine of behavior of the individuals. If an animal is enabled by its structure (including the equipment involved in its sensory behavior) to cope with its

surroundings and survive, it is likely to be able to live wherever similar surroundings exist. Species doubtless tend to extend their ranges until they reach places where the individuals can no longer accommodate themselves to the environmental conditions. This does not imply necessarily that the same kind of factor is responsible for range delimitation everywhere along the border of an animal's range. It does seem obvious, though, that the factors which delimit ranges of species must be of the same kind as determine local habitats.

If the line of reasoning suggested above is valid, then one profitable means of learning the nature of the factors effective in habitat restriction and range delimitation is to study the behavior of individuals and to pay attention to details of responses of the animals to their surroundings. Useful facts to be sought are examples of individual actions which show some connection with the environment. The observations must concern wild animals in their natural surroundings.

A major cause for confusion in attempts to analyze the environmental relations of birds may be the failure to distinguish between internal and external factors concerned in these relations. It may be impossible to separate completely these two kinds of influences and to evaluate them in the whole question of habitat behavior. But the problem would be simplified if consistent effort were made to learn the reasons for restriction in habitats by studying both the organism and its objective surroundings. It must be remembered that every individual reacts to a given set of surroundings in its own peculiar way and that the reactions of members of a species resemble one another in manner comparable to the resemblance of external features of structure. Hence it is practicable to combine items dealing with members of a single species, but not of distantly related ones.

As regards internal factors, it may be better to formulate a series of reasonable assumptions, for purposes of field analysis, than to engage in practically endless tests (measurements) of physiological and psychological activity. For example, we may accept it as demonstrated that birds have remarkably well developed powers of vision, without being able to determine with exactness many qualities of those powers. Many details have been discovered in connection with the units concerned in the physiological behavior of certain types of birds. These furnish clues as to what we may expect to learn of the physiology of other birds and of the possible relations between physiological conditions, behavior, and the external environment.

These internal factors involve the genetic history of the race and even of the individual insofar as this determines: (1) sensory responses to stimuli of vision, audition, and orientation; (2) hormonal rhythms and responses in the pituitary, gonads, and thyroid; and (3) behavior patterns involved in the nervous system.

The external factors which seem worthy of attention are mainly of two sorts—physical, having to do with topography, climate, weather, light, vegetation, and water; biotic, mainly those of food and competition with animals of other kinds or of the same kind.

Birds of the Great Basin possess certain characteristics of behavior and structural adaptation to this particular environment, which seem to distinguish them from birds, even of the same species, in other parts of the United States. Among these the following seem sufficiently prominent to deserve emphasis and to merit special study by anyone who has opportunity to watch birds in this region. In some instances these general statements are hypothetical and must remain so until more substantial evidence is available to test them.

A high proportion of the birds here is migratory, obviously on account of the severity of the winter climate. Although I have indicated that 42 per cent of the species in

the state are permanently resident, the figure is much smaller when any restricted district on the plateau is considered. Of all the categories of seasonal occurrence the one including the greatest number of individuals for any such district is that of summer residents. Stated another way, most of the birds in an area like the Toyabe region are the ones which live there during the summer. This group is larger than even the transient one. Many species which do not leave the region move to milder parts of it to escape storms.

Adult protective coloration is exemplified by a high proportion of the species, and appears to be correlated with scarcity of plant cover. The lack of an adequate screen of plants for concealment necessitates resemblance between the color of plumage and the background if the birds are not to be conspicuous. The general grayish cast throughout the whole habitat in the Great Basin extends to living as well as to other material there. Even the plants usually appear more gray than green. Most of the bird species, at least in terrestrial habitats, of the Great Basin are plainly colored. Many of these have been changed still more toward gray in this region. A large population of carnivorous species is on hand and constantly patrolling the ground, thus automatically maintaining this relationship.

Long range vision is acute, probably directly the result of scattering distribution of individuals and lack of screen of plants. On many occasions it was demonstrated that these birds of the desert are alert to see objects at great distances. The small birds need extra time to seek hiding places if discovered by predators, and all the birds require sharp vision to detect other members of the same species or to find food. These things are not only far separated over the desert, but the atmosphere is generally so clear as to permit their detection at a great distance.

Resistance to wind is effected mainly by avoiding strong winds and by possession of strong powers of flight. Even if gales are not frequent here there is often a strong wind, and the general absence of cover makes it hard for birds to avoid exposure to wind. They do seek protected places provided by bushes. One result is to strengthen the collector's impression that few birds inhabit the region. Some species which are distinctly longer-winged here than in other areas may have responded thus structurally to meet this peculiarity of a habitat distinguished by its openness. Other species which predominate in the Great Basin are ones which are strong flyers and are long-winged throughout their range. This structural modification is also advantageous in the pursuits which occur so frequently in this district.

Scattered distribution involves a high development of vocal powers to compensate for the separation of individuals. If the far separated members of a species are to hear one another, their songs and calls must be loud. Here again the characteristic species are ones possessing loud voices, and also it was observed regularly that birds in central Nevada differed in voice conspicuously from representatives of the same species in other areas, especially those nearer the Pacific Coast. And invariably voice in the Nevadan race was louder and clearer than in the Sierran or Californian one. This applied both to song and call notes.

Flight songs are noticeably frequent, probably on account of scarcity of high perches. The impression was strong, after a few seasons of field work in Nevada, that an exceptionally large proportion of the nesting species were ones in which flight song and display are conspicuous in the nesting behavior.

Resistance to heat is effected by adults mainly by avoiding it through perching in shade or off the ground. Although the air temperatures on the high plateau are not remarkably high, the clear atmosphere permits intense sunshine, and the sparse plant cover provides little protection. In the hotter parts of summer days nearly all the birds

seek to escape the intense sunshine by standing within the shadow of some plant or artificial structure. Sometimes, the birds find suitable temperatures merely by perching somewhere off the ground, but often even these places are too hot.

Nests on or near the ground are necessitated by the general limitation of the plants to low strata. Nearly every nest discovered was on the ground or so near the ground as to be easily reached by a person without climbing. Even some of the larger species which ordinarily nest high in trees commonly select low nesting sites in this area. This trait seems so firmly established that many species will take low sites when higher ones are available which resemble the normal nesting places of those birds in other regions.

Nests on the southeast sides of bushes were observed so frequently as to suggest some special significance in the circumstance. It may be connected with preference of building individuals to work in the sunshine in the early morning when the air generally is cold in this region. Or it may be partly the result of effort to escape strong wind by working in the lee of bushes. Whatever the cause, the trait was so well developed that recognition of it greatly facilitated the search for nests.

Adaptive coloration in downy young, with respect to intensity of sunlight, is shown in striking degree, and adaptive coloration of nest lining appears to parallel closely that of downy young. Young birds seem to have a narrower range of toleration of extremes of their physical surroundings than have adults. At least they are generally less able to escape unfavorable conditions than are their parents. In a series of species in the Toyabe area at least five degrees of shade are distinguished in coloration of nestling plumages (mainly down) and these are paralleled by color of the nest lining in the same species. A high positive correlation is observed between these characteristics and the kind of cover at the nest site and the general climatic ranges of the birds. Apparently those kinds of birds which nest in exposed situations, and which live in hot regions, have pale or pallid nestling plumages, and nest linings which reflect and counteract the harmful effects of sun-rays. Kinds which live in opposite conditions are dark in both these respects and thus are able to absorb and to take advantage of warmth from the sun.

The comments offered in this article are intended to summarize a series of reports dealing with materials gathered in a study of the birds of Nevada. These reports contain many facts which support statements made in this summary. They have been published as follows, by the author of the present paper.

1936. The birds of Nevada. Pac. Coast Avifauna No. 23, pp. 1–145, 1 map.

1936. Coloration of downy young birds and of nest linings. Condor, vol. 38, pp. 111–117.

1937. The natural history of magpies. Pac. Coast Avifauna No. 25, pp. 1–234, frontispiece, 20 figs. in text, 8 pls.

1938. Geographic variation in some birds in Nevada. Condor, vol. 40, pp. 36–38.

1938. Environmental responses of vertebrates in the Great Basin. Amer. Midland Nat., vol. 19, pp. 1–216, 12 figs. in text.

Museum of Vertebrate Zoology, University of California, Berkeley, September 28, 1937.

FROM FIELD AND STUDY

Feeding Behavior of a Red Phalarope.—It was a lovely sunny day. At twelve noon there was a lone Red Phalarope (*Phalaropus fulicarius*) feeding on Gibson Beach in the Point Lobos Reserve. Gibson Beach is a bend of white sand about one hundred yards long and is sheltered by bluffs. This day the sea was calm, with one line of breakers crashing close to the shore.

The lone phalarope was foraging at the high tide mark where there was a line of decaying kelp on which countless sand-fleas were feeding. Wherever the bird found good pickings it would lie flat on its belly and make rapid jabs until the supply was exhausted. The attitude and manner of the bird, the rapid jerking of the head from side to side and the quick jabs, were like those of a phalarope feeding on the surface of a pool. I believe, however, that this manner was not acquired from a habit of feeding on the surface of water, but rather was it a method of trapping its prey. I was so close at times as to see sand-fleas bouncing off from the phalarope's chest. Had the bird been standing, many of these sand-fleas would have escaped, for once out of reach they would disappear like magic into the sand.

With a strange waddling gait and a swaggering hind end the pigeon-toed phalarope would move from kelp heap to kelp heap. Up and down that hundred yards of beach it traveled. Sometimes it would retrace its steps, sometimes it would fly back and start over. On the wing the phalarope was a lovely thing. Pure white when directly overhead—the sky was very blue—and when it glided toward the beach a white bar could be seen along the outspread wing. When the phalarope approached an especially juicy bit of kelp a gush of sand-fleas would explode into the air. Then the bird would belly down and really go to work. When the sand-fleas ceased hopping the phalarope would reach down, grasp a bit of kelp in his mandibles, and give it a vigorous shake to stir up the last remaining sand-fleas.

After two hours and twenty-five minutes of continuous feeding the phalarope flew out to sea and lit on the water just beyond the first breaker. Bobbing like a cork it took a thorough bath and then apparently went to sleep. In eleven minutes it was back on the beach again. How it could hold any more food was a mystery to me, but its appetite was apparently unimpaired. However, in thirty minutes the appetite was satisfied; the phalarope, puffed out like a pouter pigeon, lay down in the sand, tucked its bill in the feathers of its back, and went sound asleep.—CHARLES W. MICHAEL, *Pasadena, California, November 15, 1937.*

New Bird Records for Brewster County, Texas.—During several periods in 1936 and 1937 the writer had opportunity to record birds in the Big Bend area of southern Brewster County, Texas. Among the birds collected or observed are nine species, or subspecies, not recorded in the recent publication by Josselyn Van Tyne and George Miksch Sutton, "The Birds of Brewster County, Texas" (Univ. Michigan, Mus. Zool., Miscellaneous Publ. No. 37, August 24, 1937). The specimens listed below were identified by Dr. Harry C. Oberholser, to whom I express appreciation. The writer is obligated also to Dr. Van Tyne who read the manuscript and offered critical comments. All specimens are in the National Park Service collection at Santa Fe, New Mexico, unless otherwise noted.

Lesser Loon. *Gavia immer elasson.* On October 17, 1937, Mr. A. G. Clark shot a loon of this species on a quiet pool in the Rio Grande near Solis Ranch, elevation 1900 feet. Mr. Clark partially skinned the bird and turned it over to me two days later. The skin is in the University of Michigan Museum of Zoology.

Pied-billed Grebe. *Podilymbus podiceps podiceps.* A lone individual observed at close range in a small cattail pond on October 26, and again on October 28, 1937. This pond is located one mile southwest of Boquillas, and about one-fourth mile from the Rio Grande at an elevation of 1850 feet.

Cormorant. *Phalacrocorax.* One observed on a sand bar on the American side of the Rio Grande at 2100 feet elevation near Castolon, March 31, 1936. Considering its small size and the location this was probably the Mexican Cormorant, *P. olivaceus mexicanus,* but since the bird was not collected the species is questionable.

Gadwall. *Chaulelasmus streperus.* On October 24, 1937, a small duck was observed on the cattail pond described above. It obviously lacked vigor and gradually grew weaker, until October 27, when it was found on the bank unable to fly. Upon preparation, it proved to be a female gadwall that appeared to have been wounded internally. The skin is in the University of Michigan Museum of Zoology.

Sora. *Porzana carolina.* One observed on October 26, 27, and 28, 1937, in the cattail pond described above. A rail was also heard calling several times during this period, usually late in the evening.

Eastern Phoebe. *Sayornis phoebe.* On the morning of October 16, 1937, one was observed in a dead willow at Glenn Spring. On October 17, James O. Stevenson called my attention to one near a cattle watering tank at Dugout, and later the same day a female was collected from the top of a bush

(*Leucophyllum*) in a dry wash at the mouth of Pine Canyon, 3700 feet elevation. On October 18, a male was collected from a dead willow near a water tank at Glenn Spring, elevation 2606 feet. One or two birds of this species were observed about a tule pond one mile northwest of Boquillas every day from October 24 to 28, 1937.

Eastern Winter Wren. *Nannus hiemalis hiemalis*. A male was collected on October 22, 1937, at Hot Springs on the Rio Grande. Another winter wren foraged near-by in a pile of drift wood and beneath heavy brush.

Nevada Shrike. *Lanius ludovicianus nevadensis*. A shrike collected near the east base of Burro Mesa, elevation 3500 feet, on March 26, 1937, has been identified by Dr. Oberholser as *nevadensis*. The skin is in the U. S. Bureau of Biological Survey collection, Washington, D. C.

Swamp Sparrow. *Melospiza georgiana*. On October 24, 1937, a male was captured in a mouse trap which had been set among the cattails at the edge of a small pond one mile southwest of Boquillas and one-fourth mile from the Rio Grande.—Adrey E. Borell, *Wildlife Division, National Park Service, January 27, 1938.*

Early Nesting Record of the Coast Bush-tit.—The earliest nesting date that I have for the Coast Bush-tit (*Psaltriparus minimus minimus*) is March 6, 1938. The nest, containing five incubated eggs, was four feet from the ground in a chamise bush on a brush-covered hillside in Reche Canyon, a few miles southeast of Colton, California. The eggs were slightly larger than normal, the weights in grams being 0.88, 0.85, 0.81, 0.79, and 0.78.

My earliest record prior to this one was a set of seven fresh eggs found in Potrero Canyon, near Banning, California, on March 14, 1920. My latest record is June 25, 1929, near Colton, where I found a nest of five eggs along with an egg of the Dwarf Cowbird. This last mentioned nest was badly torn by the cowbird and two of the eggs of the bush-tit had been broken.

My notes concerning thirty-three nests of this form of Bush-tit in San Bernardino and Riverside counties show that usually five to seven eggs are in complete sets and the average is 5.7. The average weight of 188 eggs is 0.75 gram, the largest being 0.94 gram in a set of six eggs and the smallest 0.50 gram in a set of five eggs.—Wilson C. Hanna, *Colton, California, April 12, 1938.*

Red Phalarope at Benicia, California.—On November 2, 1937, Burton Kuntz, a student of the Benicia High School, found a Red Phalarope (*Phalaropus fulicarius*) on a street near the shore of Carquinez Straits, in Benicia, Solano County, California. The bird was in a dazed condition and died shortly after it was found. It was brought to me and I have preserved it as a skin. It proved to be a female. The stomach was empty with the exception of a single, small lead shot; there being no indication of bodily injury, this may have caused lead poisoning. Verification of the identification of this skin as that of a Red Phalarope was made by Mr. J. Grinnell at the University of California.

Four days later, November 6, I observed several phalaropes which appeared to be of this species in the waters of Carquinez Straits near the Martinez wharf. The Red Phalarope being a pelagic species, it is possible that the severe storms at the end of October blew a flock of these birds inland. Benicia is a little over forty miles directly east from the seacoast, or, in a northeasterly direction, twenty-five miles from the Golden Gate.—Emerson A. Stoner, *Benicia, California, February 9, 1938.*

Nesting Dates from the Humboldt Bay Region.—Band-tailed Pigeon (*Columba fasciata*). On May 23, 1923, a nest was found in a lowland fir, sixteen feet up. The nest, nicely cupped and made of dry spruce and fir twigs, contained a very young squab. Found in mixed woods, south of Eureka limits. On June 3, 1924, a nest of the same species was found in a lowland fir eight feet up. The nest was a mat of dry spruce twigs and contained a single egg, incubation about a week. Found in woods north of Eureka. On May 23, 1925, another nest was found in a lowland fir, fourteen feet up. The nest was a mat of spruce and fir twigs and contained one egg, incubation about one week. Found in woods north of Eureka. On June 14, 1925, a nest was found in a lowland fir sixteen feet up. This nest was a dirty mat of dry twigs containing a quill-covered squab. Found in woods north of Eureka. Yet another nest was found on July 7, 1925, in a lowland fir, eight feet up. This nest, made of a few dry twigs, contained one egg, incubation about one week. Found in woods north of Eureka. Finally, on June 12, 1926, a Band-tailed Pigeon's nest was found ten feet up in a lowland fir, a dirty mat of spruce and fir twigs containing a feathered squab. Found in woods north of Eureka. An adult pigeon was flushed from each of the above described nests.

On May 7, 1916, a nest of the Coast Pigmy Owl (*Glaucidium gnoma grinnelli*) was found in a flicker's excavation in a dead spruce, sixteen feet up. It contained five eggs, incubation about a week. Found in woods north of Eureka.

On May 5, 1904, a nest of the Oregon Jay (*Perisoreus obscurus*) was found in a spruce tree, ten feet up. It was made of green moss and dry spruce twigs, damp earth and dead alder strips, thickly

lined with coarse dry grass. It contained three fresh eggs. Found in a small spruce grove one mile south of Arcata.

Another Oregon Jay's nest was found on May 17, 1915, in a lowland fir, thirty-six feet up. It was made of green moss, dry spruce twigs, damp earth, and dead alder chips, lined with coarse dry grass. It contained four eggs, incubation almost complete. Found in the woods south of Eureka.—JOHN M. DAVIS, *Eureka, California, March 17, 1938.*

Reddish Egret Again Seen near San Diego.—While I was driving across the bridge between North Island and Coronado, in San Diego County, California, at about one o'clock on the afternoon of September 25, 1937, I saw a strange egret-like bird at the southeast end of the bridge. It was in company with several Snowy Egrets on the salicornia flats. After the car stopped, at a distance of about 150 feet from the bird, its reddish head and neck were observed. When it flew five minutes later, the light-colored undersurface of the wings and body was displayed.

Because I had just spent a year in Florida, the immediate thought was Reddish Egret (*Dichromanassa rufescens*); and this was confirmed when I visited the San Diego Museum and examined a mounted group of this species on exhibition there. The one previous report of this species in California was also from the vicinity of San Diego (Huey, Condor, vol. 33, 1931, p. 125).—R. R. DELAREUELLE, *Aviation Cadet, Naval Air Station, San Diego, California, April 15, 1938.*

White-throated Sparrow Killed by Copperhead.—A striking demonstration of one of the hazards to which birds are exposed, namely, attack by snakes, was witnessed about 2:30 p.m. on February 27, 1938, at Alum Creek in the Bastrop State Park, near Bastrop, Texas. I had just killed a White-throated Sparrow (*Zonotrichia albicollis*) which, with five or six others, had been scratching for food in the leaf litter under a yaupon bush (*Ilex vomitoria*) at the edge of a clearing. When I went over to retrieve the bird, my attention was attracted to a second bird of the same species that was thrashing about among the dead leaves. At first I thought I had wounded it; but when I reached over to pick it up I discovered that it was struggling to escape from a copperhead snake (*Agkistrodon mokasen*). The snake had the bird by the back of the head, holding on tenaciously, and periodically clamping its jaws tighter as if trying to sink its fangs and teeth deeper.

Approximately three minutes elapsed from the time the struggle first was observed until the bird relaxed, apparently dead. The snake, still holding to its intended prey, then attempted to drag its kill farther back into the pile of litter. Curious to see what would happen if I interfered, I took a stick and attempted to drag the snake into the open. Evidently the instinct of self preservation overcame that of hunger; for the snake released its kill immediately and attempted to escape by burrowing into the pile of leaves. Finally it was captured.

An autopsy revealed that the sparrow had not been wounded by my gun-shot and that apparently it had been captured while in sound condition. The fangs of the snake had penetrated the cranium and pierced the brain, causing a slight hemorrhagic condition. Death, of course, doubtless resulted from the poison injected.

The fact that the copperhead captured and killed an apparently normal bird leads one to wonder how severe this type of predation is on small birds which habitually scratch among leaf litter for food. The copperhead is so colored that it is discernible when motionless among dead leaves only by close scrutiny; hence it is admirably adapted, as far as color is concerned, to feed upon birds with such habits. Also, the tendency the snake exhibited to conceal itself under the leaves leads me to suspect that it may have lain in hiding and "pounced" upon the unsuspecting bird.—WILLIAM B. DAVIS, *Agricultural and Mechanical College, College Station, Texas, March 14, 1938.*

American Scoter in the San Francisco Bay Region.—Grinnell and Wythe (Pac. Coast Avif. No. 18, 1927, p. 55) list the American Scoter (*Oidemia americana*) as a "very rare mid-winter visitant" in the San Francisco Bay region. The species has, in fact, been recorded but relatively few times from the entire coast of California. It therefore appears worth while to record the collecting of an adult female American Scoter by Leonard Penhale of the Department of Exhibits, Califorina Academy of Sciences, on March 10, 1938, at Drakes Bay, Marin County, California.

On the same day that the above specimen was secured at least six adult males of the same species, all readily distinguishable from the numerous White-winged and Surf scoters by the bright lemon yellow on their bills, were likewise seen on this bay. The observer stated that a male and several female Old-squaw Ducks (*Clangula hyemalis*) were also noted at the same time but were too wary to allow close approach.—ROBERT T. ORR, *California Academy of Sciences, San Francisco, March 29, 1938.*

A Migratory Flock of Ibises in Utah.—The White-faced Glossy Ibis, *Plegadis guarauna*, is a fairly common summer resident on the east side of Great Salt Lake, particularly along the fresh-

water sloughs in the region where the Bear and Jordan rivers enter the lake. It is rather unusual, however, to see huge congregations of these birds outside their usual marshy habitat, such as was observed on the morning of September 19, 1937. On that day a concentration of ibises was noted at 8:00 a.m. some 20 miles south of Salt Lake City. A large field had become temporarily flooded by an overflowing irrigation ditch and the ibises were scattered about through the flooded area which occupied some 10 acres. For the most part, the birds were busily feeding and probing in the mud, but a slight wind was blowing which kept the flock restless so that small groups of the birds were constantly rising with labored flight and moving to neighboring spots.

At one time I made a count of roughly 300 ibises in sight, feeding or flying about. The number of ibises present was undoubtedly far in excess of this figure, however, because the tall weeds tended to hide the birds. The inference from this observation is that the flock was a migratory one, establishing the approximate date of fall migration of this species. Also it gives some intimation of the numbers of ibises that may congregate after the summer nesting season.—WILLIAM H. BEHLE, *University of Utah, Salt Lake City, Utah, September 20, 1937.*

The Brewer Sparrow in Glenn County, California.—Records of the Brewer Sparrow (*Spizella breweri*) from the San Joaquin Valley and from the vicinity of Eagle Lake are fairly common, but I have been unable to find any published record of this bird having recently been reported from any place in the Sacramento Valley. On February 27, 1937, a student of mine collected a Brewer Sparrow near a chicken yard at Orland, California. The bird was with a flock of Gambel Sparrows at the time. The skin was donated to the Museum of Vertebrate Zoology, where it is recorded under the accession number 5517, and bird department number 73158.—LLOYD G. INGLES, *Chico State College, Chico, California, May 10, 1938.*

Additions to the Brewster County, Texas, Bird List.—The following account of birds observed or collected by the writers in 1937 in Brewster County, Texas, is confined to species not recorded from that region by van Tyne and Sutton (The Birds of Brewster County, Texas, Misc. Publ. Mus. Zool. Univ. Mich., No. 37, 1937) or adds data on species of uncommon occurrence in the county. Records for the Pied-billed Grebe and Eastern Phoebe are given in addition to those mentioned by Borell (*antea*, p. 181). Sight identifications made in October were obtained by Stevenson.

Grebe. *Colymbus* sp. One was observed swimming in a small cattle pond, 6 miles east of Alpine, October 14. The bird, probably an Eared Grebe (*Colymbus nigricollis californicus*), was not collected, so that its specific status could not be positively determined.

Pied-billed Grebe. *Podilymbus podiceps podiceps.* One seen at a cattle tank 27 miles east of Marathon, along U. S. Highway No. 90, October 18.

Ruddy Duck. *Erismatura jamaicensis rubida.* On October 14, an individual was found with a small flock of Green-winged Teal at the cattle pond 6 miles east of Alpine.

Dwarf Red-shafted Flicker. *Colaptes cafer nanus* Griscom. Since few specimens of this recently described subspecies have been taken in the United States, we are recording a female, collected by Smith at Boquillas, on the Rio Grande, August 10. This is the breeding Red-shafted Flicker of the Big Bend region, according to van Tyne and Sutton (*op. cit.*, p. 46), who consider it as "rather uncommon and local in distribution . . .". They list only three specimens (breeding birds) collected May 1 and June 1, *1933, in the vicinity of Marathon, in the northern part of the county.*

White-eared Hummingbird. *Hylocharis leucotis.* An immature specimen, collected by Smith in the Chisos Mountains, July 7, constitutes the first record of this species for Texas. The bird was discovered along the trail between "Laguna" and Boot Springs at about 7,000 feet elevation. The hummingbird was observed feeding at a maguey plant and disputing the presence of several Broad-tailed Hummingbirds (*Selasphorus platycercus*) in the vicinity. This specimen is now in the Biological Survey Collections in the U. S. National Museum.

Eastern Phoebe. *Sayornis phoebe.* On October 14, Stevenson collected a female from a road-side fence, 5 miles southwest of Marathon. One was seen with A. E. Borell, October 17, at "The Dugout" and another at the mouth of Pine Canyon, in the southern section of the county.

Black-chinned Sparrow. *Spizella atrogularis evura* Coues. The only definite records of this species in Texas are two specimens mentioned by van Tyne and Sutton (*op. cit.*, p. 112) as collected in the Basin, Chisos Mountains. On June 16, Smith collected an adult female in the Basin and later, on July 6, discovered two adults with four bob-tailed young, apparently just out of the nest, in a small juniper near Kibbee Spring, about 6,000 feet elevation, in the Basin. The adult male was collected by Smith. This is the first breeding record for the species in the State.

The authors wish to thank Dr. H. C. Oberholser, Bureau of Biological Survey, for the identification of the above-mentioned specimens.—JAMES O. STEVENSON, *National Park Service, Washington, D. C.*, and TARLETON F. SMITH, *Texas A. and M. College, College Station, Texas, May 9, 1938.*

Florida Gallinule on the Suisun Marshes.—While shooting on Simmons Island in the Suisun Bay, on the last day of the hunting season, December 26, 1937, a Benicia hunter killed and brought to Benicia three "large rails" along with his bag of ducks and mud-hens. When he spoke to me about large rails, I immediately became interested, whereupon he kindly invited me to his home where he showed me the birds. They were Florida Gallinules (*Gallinula chloropus cachinnans*); as I had never seen this species before, he gave me the three specimens. I have preserved two of them as scientific skins and the third as a mounted specimen. All of them are males.

This hunter told me that birds of this species appeared to be common on the island named, and that he knew of several hunters who had killed them there, thinking they were rails, and that they considered them very fine eating. The exact location where the three birds were taken was near the mouth of Noyce Slough, on Simmons Island. This island is in Solano County immediately south of Grizzly Island.

Mr. Henry E. Parmenter of San Francisco advises me that on February 19, 1935, he and Mrs. Parmenter saw a single bird of this species on the Suisun Marshes in a small slough entering Montezuma Creek, near Dutton's Landing, a little to the east of Grizzly Island. In view of its presence here on these winter dates this species is no doubt resident on this marsh.—EMERSON A. STONER, *Benicia, California, February 9, 1938.*

Does the Ouzel Use Its Wings in Swimming?—So often have I seen the statement in print that the Water Ouzel (*Cinclus mexicanus*) uses its wings when swimming under water that in spite of my suspicious nature I had almost reached the point of accepting the statement as truth. However, my own observations through the years and my better judgment still make me hesitate and wonder. Could it be possible that John Muir's famous tale of the ouzel is responsible for the building up of a legend? I believe that any ornithologist who has studied the writings of Muir will admit that he was not outstanding as a bird student.

Through the years I have had much opportunity to study the habits of the ouzel, but never did I see it using its wings to forward its underwater progress. Ouzels usually fish in such turbulent waters that it is not possible to study their underwater movements. However, in the Yosemite Valley there did come the opportunity to study the swimming habits of the ouzel under favorable conditions. In this case a pair of ouzels had built their nest in an unusual situation—unusual inasmuch as the nest was placed on a boulder that was completely surrounded by unbroken water. Directly below and in front of the nest there was practically no current. The pool was of varying depth, from two to six feet, and very clear.

During the time that the river was in full spring flood and while the male ouzel was feeding his mate in the nest he did much foraging on the surface of the pool, swimming about on the water in the manner of a phalarope. From a perching stick, which I had placed for his convenience, on rare occasions he was seen to dive and to swim under water, but at no time was he seen to use his wings. The purpose of these dives I never learned. The bird never went to the bottom or did it appear to forage under water.

If an ouzel does not use its wings as an aid to progress while swimming on the surface of the water why should it be necessary, or even to its advantage, to use its wings while swimming under water?

The ouzel when swimming kicks its feet rapidly and alternately. When foraging under water it shows a preference for strong currents. The preference for swift water is probably due to the fact that the bird has learned to take advantage of the pressure afforded by the current to hold its body down.

Even when fishing in a shallow riffle the ouzel always heads up-stream and works against the current. After working up-stream for some distance the ouzel may unloosen its toe-hold and float down stream on the current to shallow water where it can regain its toe-hold without diving and then once more tread upward, looking like some sort of huge water-beetle. This behavior might be likened to the foraging habit of the creeper, which bird slowly works up a tree trunk and then drops down to start over.

In swimming, open wings against the current would seemingly be more of a detriment than an advantage. Many times in shallow water I have seen an ouzel walking along the bottom of the stream against the current with the water racing over its back. The stream-lined body of the ouzel offered little resistance and such pressure of current as there was helped to hold the bird to the floor of the stream. Headed into the current, with feet firmly planted and head held down the body could be held at the proper angle to keep the ouzel on the bottom. In strong current an ouzel could stand quite still, but in a slight current the ouzel would be forced to move up-stream to produce the necessary current pressure to hold its body down.

Coming up in swift water the ouzel fairly pops to the surface and often takes off with such speed as to give the impression of having taken the first wing strokes while still under water.

A near approach to flying underwater came to my attention while I was watching an ouzel at the top of Lower Yosemite Fall. The bird was foraging on the very brink and was inadvertently swept over the fall. The ouzel dropped perhaps thirty feet in the swirl of mist, came out flying and returned to its former position. The ouzel appeared not the least disturbed by what had seemed to me a perilous adventure.

Does any bird use its wings both for swimming and for flying?—CHARLES W. MICHAEL, *Yosemite, California, November 20, 1937.*

Cowbirds in Western Nevada.—On May 30, 1938, I observed five cowbirds (*Molothrus ater artemisiae*), three males and two females, in a field on the old road to Verdi, about two miles west of the Reno (Nevada) city limits. They were watched with an 8×30 glass at a distance of fifty feet, for twenty minutes. Two males were conducting a sort of dance, with feathers ruffed at nape, in apparent courtship of one of the females. Had identification by the brown head of the males and the short stout bills not already been made, it would have been simple when a pair of Brewer Blackbirds alighted to feed with them.

This appears to be an unusual record for western Nevada. Jean Linsdale in "The Birds of Nevada" (Pac. Coast Avif. No. 23, 1936, p. 116) shows only one record for Washoe County, that of an adult male obtained by Ridgway at the Truckee reservation, on June 2, 1868.—DRYDEN KUSER, *Reno, Nevada, June 16, 1938.*

Hutton Vireo with Young in February.—On February 26, 1938, while studying birds in the hills back of Whittier, California, I was surprised to see a Hutton Vireo (*Vireo huttoni huttoni*) approaching a nest. This was situated on the extreme end of an oak limb, pensiled, and in an exposed position. It was approximately 20 feet from the ground. The nesting tree was in the center of a group of oaks on a hill side.

The nest was of the usual Hutton Vireo type, made of fine fibers covered with green moss and lined with fine grasses. Unable to reach the nest, which I supposed to be ready for eggs, I climbed a nearby oak and with the aid of field glasses obtained a good look at the nest and its occupants, namely, four baby vireos, which were probably a day or two old.

On March 14, I returned to the nest, to find it empty and the four young birds in a nearby elderberry tree. I caught one of them and it perched on my hand for some time. The parents were anxious as to its well-being and came very close to me. The young bird finally heeded their frantic calls and flew back into the tree. At this time an industrious pair of Green-backed Goldfinches was removing the nesting material from the vireo's nest and placing it in their own nest in a nearby tree. —E. M. HALL, *Whittier, California, June 9, 1938.*

Harris Sparrow at Buena Park, California.—In the late afternoon of April 23, 1938, a Harris Sparrow (*Zonotrichia querula*) was noticed in company of a small flock of Gambel Sparrows (*Zonotrichia leucophrys gambelii*) that were coming to the feed trays in our back yard. During the next four days it was observed at close range a number of times and it was last seen about 5:00 p.m., April 27. The last Gambel for the season was seen on April 28.—JOHN MCB. ROBERTSON, *Buena Park, California, May 30, 1938.*

NOTES AND NEWS

Readers of the *Condor* familiar with John L. Ridgway's ability as an illustrator will be glad to know of his recent book on "Scientific Illustration" (Stanford University Press, 1938, xiv +173 pp., 22 pls., 23 figs. in text). This is a manual which begins with the simplest fundamentals of the subject and treats ultimately the special problems and customs in many separate fields of science. To anyone, whether ornithologist or not, who contemplates publishing in scientific journals, this volume will give points of good advice. The plates illustrating lighting effects, arrangement of figures, and types of reproduction are excellent examples of the principles discussed.—A. H. M.

The late Junius Henderson, known so pleasantly to many Cooper Club members, and an extensive contributor to the *Condor* from 1906 to 1927, is accorded fitting remembrance in a special number of the *University of Colorado Studies* (vol. 25, no. 2, March, 1938, pp. 117-160; Boulder, Colorado, price $1.00). His was a truly broad scientific interest. He worked untiringly in geology, paleontology, conchology, and ornithology; he published importantly in all these fields, as well as, in a lesser way, in mammalogy and ethnology. Aside from the absorbingly interesting biographical portion of the present memorial, a permanently useful feature is the complete bibliography, enabling a student in any one of the several fields, quickly to locate whatever Henderson may have written within its scope. At the time of his death, November 4, 1937, Henderson was Professor Emeritus in the University of Colorado. Appropriately, four of his

colleagues have united their appreciative efforts in preparing this memorial: Hugo G. Rodeck, Philip G. Worcester, Theodore D. A. Cockerell, and Gordon Alexander.—J. G.

"The Birds of El Salvador," by Donald R. Dickey and A. J. van Rossem, was issued in the Zoology Series of the Field Museum of Natural History in late March of this year. The volume (no. 23) is a major contribution to the ornithology of Central America and deals with a section of tropical birdlife which has been poorly known except as the preliminary papers of the authors have described it. The work comprises 609 pages, 29 figures (chiefly maps), and 24 plates. It is essentially van Rossem's writing, but the joint authorship affords appropriate recognition of Dickey's interest and support of the project until the time of his death in 1932. El Salvador is a small country and the study of its bird-life has required consideration of problems in adjoining areas. This has added materially to the scope and usefulness of the paper. The avifauna is typical of the arid tropical zone of the Pacific slope. The accounts of species include not only matters of taxonomy and distribution, but much valuable information on nesting, habitats, and plumages. One is impressed with the advantages gained through van Rossem's own extensive field work in the country. Most of the birds collected were prepared by him. Ideally, all such reports should be similarly grounded in the field experience of the author.—A. H. M.

"A profession is a body of men who voluntarily measure their work by a higher standard than their clients demand. To be professionally acceptable, a policy must be sound as well as salable. Wildlife administration, in this respect, is not yet a profession." (Aldo Leopold, in *Outdoor America*, Official Publication of the Izaak Walton League of America, vol. 3, no. 3, January, 1938, p. 3.) This is just one out of many sagacious sayings in recent issues of this vigorous exponent of conservation.—J. G.

Mr. Hooper's account of a blue-jay shoot in the present issue of the *Condor* (p. 162) brings out clearly that it is the recreation or sport motive that primarily actuated the affair. And, upon reflection, why was it not "morally" quite as justifiable as the concentration of shooters on *quail* on the opening day of last quail season? It was, unquestionably, the sport or recreation involved in the hunt that counted with so many men in both instances. The bit of meat in the quail bodies, save perhaps for a certain traditional association of ideas, surely did not greatly overweigh the quail as an objective. With the continuing reduction of all native *game* birds, so called, it does look as though the present trend

Fig. 44. Walter Penn Taylor, member of Cooper Ornithological Club for 33 years; now Senior Biologist, U. S. Biological Survey, in charge Texas Cooperative Wildlife Service, Agricultural and Mechanical College of Texas; sturdy exponent of conservation as based on sound biological understanding.

on the part of sportsmen's clubs and game commissions to promote "vermin" hunts might be the inevitable and, indeed, rational recourse. A lively article in *Colorado Conservation Comments* (vol. 1, no. 2, March 15, 1938, p. 11) is entitled "Croak the Crow" and illustrates the point of view. Excerpts: "Fellows, we are passing up a great sport! There are enough birds in northern Colorado to keep the sportsmen busy (and broke, buying shells) from December to May. . . . Here's a chance to match wits with a bird that sure knows what the word 'caution' means. . . . Besides furnishing sport that is real sport, just think of the good you will be doing for next year's crop of ducks. . . . Better get the fever. Every crow croaked saves a score or more of duck eggs and fledglings [*sic*]." Observe the note of justification! Speaking personally, the under-initialed can see no more, no less, reason for killing crows and jays than doves and quail, though he confesses that the latter appeal to him, *alive*, more than the former, on sentimental ground. Quail and doves occupy a place in one's mind more along with meadowlarks and orioles and vireos—a bit the better to see and hear, and

to enjoy alive. The major fault with the jay and crow shooting is that it often is done in the other birds' breeding season—with no inconsiderable margin of hazard to other things, both game and non-game, that fly or run. If there must be "vermin", let us have an open season on these so-called predators, regulated to coincide with the season on "game" species!—J. G.

Through the years we have witnessed a long series of impressive projects undertaken in the general natural history field, usually by groups of persons or by organized agencies. These often have been announced extensively—reams of outlines and prospectuses issued. Continuance of actual work on a well-considered plan has in some cases been of adequate duration, leading to genuinely worthy results, of lasting value to science. On the other hand, all too frequently, serious activity has been brief-lived; announcements of "progress" have been less and less frequent; finally the idea of "something under way" has been lost to our consciousness—save as through delving among old papers it may be recalled to mind. Especially do "cooperative" enterprises now appear, in the light of past observation, as projects of dubious promise. It looks as though, in the human species, *individual* enterprise, opportunity sought out by the individual and taken advantage of through individually exercised industry and intelligence, most often makes for real accomplishment of aims. *We* are not *ants*! Our evolutionary line has not led us into that form of social behavior. So, with ornithological work, in whatever subfield, let the person who does not happen to be "attached," take heart; there is yet hope of distinguished success for the free-lance worker!—J. G.

MINUTES OF COOPER CLUB MEETINGS

NORTHERN DIVISION

MARCH.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, March 24, 1938, at 8:00 p.m., in Room 2503, Life Sciences Building, Berkeley, with President Emlen in the chair and about 65 members and guests present. Minutes of the Northern Division for February were read and approved. Minutes of the Southern Division were read. Richard G. Dahl, 5061 Congress Avenue, Oakland, was proposed for membership by Alden H. Miller. President Emlen announced a regular meeting of the Northern Division in April, and also spoke of a lecture to be given by Dr. A. A. Allen in San Jose on April 13, under the auspices of the Audubon Society. Mrs. Kelly exhibited sheets of wildlife stamps and spoke of the desirability of their sale now, this being Wildlife Week, for the support of the Wildlife Federation.

Mr. Grinnell reported on the latest publication, Volume I of "The Handbook of British Birds," by Witherby, Jourdain, Ticehurst and Tucker. Citing model examples from this new work, Mr. Grinnell emphasized the desideratum of simple, concise phraseology in expressing the manner of occurrence of birds.

Mr. Miller initiated the field observations with a report of the arrival of Cliff Swallows at the Life Sciences Building this morning, March 24. Mr. Brown reported a Rough-winged Swallow seen at the Berkeley Stadium this morning. Mr. Durham spoke of the continued presence until recently, of numbers of various waterbirds at Isabel Point, Contra Costa County. In a report upon many dead birds, including numerous gulls, found along a stretch of the Berkeley waterfront at the end of the 1937 duck season, Mr. Sibley emphasized the great need for control of shooting along the Bay.

Mr. E. Lowell Sumner, Jr., the scheduled speaker of the evening, was unavoidably absent. Mr. Joseph Dixon, kindly assuming the responsibility, gave an adequate and interesting account of the Third North American Wildlife Conference, recently held in Baltimore. He dwelt upon the commendable work of the Hudson Bay Company in beaver conservation, and sketched the variety of other subjects discussed. The significance of the conference as a meeting place for all wildlife agencies, and the interest demonstrated, afford definite encouragement even to conservationists who are naturally pessimistic.

Adjourned.—FRANK RICHARDSON, *Acting Secretary.*

APRIL.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, April 28, 1938, at 8:00 p.m., in Room 2503 Life Sciences Building, Berkeley, with President Emlen in the chair and about 130 members and guests present. Minutes of the Northern Division for March were read and approved. Minutes of the Southern Division were read in part. Names proposed for membership were: C. M. Goethe, Capital National Bank Building, Sacramento, California, by J. Grinnell; Eastham Guilo, Papeete, Tahiti, by Eric C. Kinsey; Aldo Starker Leopold, Museum of Vertebrate Zoology, Berkeley, California, by Alden H. Miller; Leonard Penhale, California Academy of Sciences, San Francisco, by Robert T. Orr.

Mr. Albert Wolfson announced that a number of Oregon Juncos, which normally migrate northward in April, had been held over and would be released in breeding condition toward the end of May, to determine whether or not they would then migrate. These birds have been marked with a large feather attached to the upper tail coverts, and persons seeing any Juncos so marked are requested to report the occurrence, including if possible the color of the feather, to Mr. Wolfson at the Museum of Vertebrate Zoology. Mr. Miller

reported briefly on the Thirteenth Annual Meeting, held at Fresno, April 15 to 17.

Mrs. Kelly called attention to the fact that this was the time to see migrating shorebirds at Alameda, mentioning particularly the Dowitchers in full breeding plumage. Mr. Sibley added that the Ruddy Turnstone was also present. He had recorded an Anthony Green Heron in Strawberry Canyon, April 23, a new vagrant species for the campus list of birds. Mr. Dyer reported the arrival of Bullock Orioles in southern Alameda County on April 6. Mr. Lloyd Ingles said that records he had kept at Chico, California, showed the arrival of the orioles on April 9 or 10 for five consecutive years. Mr. Hopkins announced the project to publish a list of the birds of the Lake Merced neighborhood, San Francisco, by the Oakland Ornithological Club. He reported no damage to bird life so far, from the reclamation work on the shores of Lake Merced, where 176 species have been recorded.

As speaker of the evening, Mr. Ernest I. Dyer showed several reels of motion pictures of California birds. These included a number of sections to be added to his "photo-monographs" on the Road-runner and the California Thrasher. Natural color photographs of American Egrets near Gustine were especially beautiful. A heronry in oak trees near Stockton contained 90 Great Blue Herons. Pictures of California Condors, taken at the boundary between San Luis Obispo and Santa Barbara counties, included some excellent close-ups of a young bird which had been made to spread its wings. There were many studies of birds in the gardens of Mr. Dyer and Dr. Eric Reynolds.

Adjourned.—FRANCES CARTER, *Recording Secretary.*

SOUTHERN DIVISION

MARCH.—About 65 members and guests attended the regular monthly meeting of the Southern Division of the Cooper Ornithological Club, held at the Los Angeles Museum on Tuesday, March 22, 1938. President McCoy called the meeting to order at 8 p.m. The minutes of the Southern Division for February were read and approved; the minutes of the Northern Division were read by title.

Mr. John McB. Robertson announced the preparation of the new roster of members which is to appear in the May issue of the *Condor,* and requested that members report any changes of address to him by April 15. He also stressed the importance of members sending signed proxies to Mrs. Grinnell if they do not expect to be present in person at the annual meeting in Fresno on April 15.

Mr. McCoy announced that the Avicultural Society will hold its annual meeting at the Bird Farm on Catalina Island on Sunday, April 3, and extended an invitation to Cooper Club members to join the party. Those wishing to go were asked to contact Mrs. Edna Parts, of 3628 Revere St., Los Angeles, to obtain tickets at the reduced rate extended to the group. Mr. McCoy also announced that Dr. A. A. Allen will give two programs under the auspices of the Pacific Geographic Society while in southern California. One of the members present indicated the dates of these programs as April 19 in Pasadena and April 21 in Los Angeles.

President McCoy then introduced Mr. Robert T. Moore, the speaker of the evening, who presented "A Zoological Reconnaissance of the Barranca del Cobre, Southwest Chihuahua, Mexico." Mr. Moore accompanied his talk with moving pictures and colored lantern slides, illustrating the characteristic biota of the different life zones through which his party passed from the cactus plains at Navajoa near sea level, in extreme southern Sonora, to the highest point of the Mexican Plateau at 8500 feet altitude, near the northern rim of the Barranca del Cobre. The extensive collections of plants and animals taken in this and neighboring areas in the past five years have led to some tentative conclusions regarding the limit of the northward extension of the Tropical Zone on the west coast of Mexico. Mr. Moore suggested that the presence of certain so-called "tropical forms" of bird-life in southern Sonora and northern Sinaloa should not be used as proof that the Tropical Zone extends that far north. He indicated that certain of these tropical forms are tolerant of cold and have been found nesting at high altitudes. Examples were cited of the Thick-billed Parrot nesting at 10,000 feet on Mt. Mohinora in southwestern Chihuahua, of Military Macaws and Finch Parrots nesting at 5000 feet, and of Long-tailed Jays at 4000 feet. He pointed out that other factors, such as the extent of typically Sonoran bird forms southward and of typically tropical plant forms northward, should be considered before the limits of the Tropical Zone can be definitely determined.

The great Barranca del Cobre, more than a mile deep and many miles wide, was shown to rival our own Grand Canyon in grandeur. The contrast between this extremely arid canyon and the short humid canyons of the western slope of the great Mexican Plateau was briefly discussed. Interesting views of the native Tarahumare Indians of the Mexican Plateau and higher sierra, including the first moving pictures of the celebration of their annual religious festival, "El Dia de San Isidro," added to the well-rounded picture of the area.

After Mr. Moore's talk the meeting was open for discussion, and the speaker was called upon to answer several questions.

A movement to adjourn was made and seconded, but forgotten as Dr. Bishop arose to announce that certain ornithologists had been pres-

ent at the "arrival of the swallows" at the San Juan Capistrano Mission on March 19, and he thought the club should know the truth about the story. Mr. McCoy then indicated that he had been at the Mission from Wednesday, March 16, until Friday morning, March 18, during which time he saw as many as 25 to 30 swifts but no swallows. He was replaced Friday afternoon by Mr. Cantwell. Mr. Cantwell, called upon for a report of his experiences, said that on the afternoon of Friday, March 18, he saw two Cliff Swallows among the numerous swifts, and that on March 19 he saw three. He did not see any large flock of swallows, though rumor was rife that a flock had been seen. He was present at the broadcast on Saturday morning when the announcer declared "the swallows are here," though the Father at the Mission would make no such assertion. Other members indicated that they, too, had been at the mission on March 19 and that undoubtedly many persons were mistaking the swifts for swallows.

Dr. Wood announced that Mr. Kinsey from the Northern Division was present, and asked him to say a few words. Mr. Kinsey spoke of the coming meeting in Fresno and urged all Southern Division members to attend. There being no further discussion or comments, the forgotten motion for adjournment was recalled and adopted.

Adjourned.—HILDEGARDE HOWARD, *Secretary*.

THIRTEENTH ANNUAL MEETING

The thirteenth annual meeting of the Cooper Ornithological Club was held Friday, April 15, to Sunday, April 17, 1938, at Fresno, California, under the auspices of the Department of Agriculture and Biology of Fresno State College. On Friday morning, following the registration of members and visitors, the meeting was called to order in Room 200, McLane Hall by President John T. Emlen, Jr., of the Northern Division. Frank W. Thomas, President of the College, welcomed the group and response was made by Loye H. Miller, representing the Southern Division.

In the absence of Howard Robertson, President of the Corporation, Chairman Emlen called upon Alden H. Miller, senior Vice-President, to preside over a brief business session, with George Willett as secretary. At this time two committees were appointed by the Chair: to check proxies, John McB. Robertson, chairman, W. Lee Chambers and Hilda W. Grinnell; to present nominations for directors for the coming year, John G. Tyler, chairman, Herbert N. McCoy and John T. Emlen, Jr. Adjournment was then taken until Saturday morning.

Papers read at the opening session were: Natural and experimental modification of color in *Colaptes*, by F. H. Test; The game codes of Germany and Italy, by T. I. Storer; Birds of an Arctic-Alpine nesting habitat on Mount Baker, Washington, by W. T. Shaw; Notes on winter behavior of the Merriam turkey, by A. Starker Leopold; and Adaptation of soil conservation practices to wildlife management, by A. C. Hawbecker.

Papers read at Friday afternoon's session were: Seasonal movements of valley quail, by J. T. Emlen, Jr.; Remarks on the redpolls, *Acanthis linaria* and *Acanthis hornemanni*, by L. B. Bishop; Game management in California, by H. C. Davis; The comparative embryology of the cormorant, by J. B. Price; the air mattress of the brown pelican, by F. Richardson; The needs of oak-tree insect-pest control methods non-detrimental to bird life, by C. B. Lastreto; and The relationship of *Junco caniceps* and *Junco oreganus*, by A. H. Miller.

From 4:30 to 5:30 p.m. the Department of Agriculture and Biology held open house and the bird and mammal collections were inspected under the guidance of George W. Graves and staff members and students of the Department.

On Friday evening the Board of Governors and Directors met for dinner at Hotel Fresno, following which the annual meeting of the Board was held. (See p. 191.)

On Saturday morning, April 16, 1938, members met in Room 200, McLane Hall, Fresno State College, Fresno, California, at 9:30 a.m., for the adjourned business session, with Howard Robertson, President of the Board of Directors, in the chair. Secretary Willett read minutes of the last business session. The proxy committee reported that, of a total membership of 876, 81 members were present and 411 were represented by proxies. The chairman therefore declared a quorum to be present.

The nominating committee reported the following nominations for directors for the ensuing year: John S. Appleton, W. Lee Chambers, Joseph Grinnell, Jean M. Linsdale, Alden H. Miller, J. R. Pemberton, Howard Robertson, John McB. Robertson and George Willett. Upon motion by Loye Miller, seconded by Joseph Dixon, and duly carried, the nominations were declared closed and the above nominees declared elected.

There being no more business to transact, President Robertson announced the business session adjourned and at 9:45 a.m. invited Professor Shaw, chairman of the arrangements committee, to preside over the presentation of papers.

The following papers were read: The songs of mockingbirds, by Loye Miller; Some Alaskan gyrfalcons, by L. B. Bishop; Nuptial note of the Anna hummingbird, by T. L. Rodgers; The Texas nighthawk in the breeding season, by Gayle Pickwell; and The California cowbird and its relation to certain other species, by J. G. Tyler.

Papers presented on Saturday afternoon were: Some nesting birds at Huntington Lake, Fresno County, by A. E. Culbertson; Some observations

on the Sierra Nevada rosy finch, by H. Twining; Ocean waifs and what they mean for distribution, by J. Grinnell; The starling and the West, by J. T. Nichols (read by title); and June on the tundra, by A. A. Allen. Then followed a much appreciated offering not scheduled on the program—the presentation by Dr. Allen of motion picture film accompanied by sound. This was made possible by the cooperation of the Fresno State College and the Museum of Vertebrate Zoology in securing a sound-producing machine from San Francisco. A delighted audience heard the cries of the limpkin and the calls of the ivory-billed woodpecker and of the whooping crane; also those of other birds of lesser degree of rarity.

Throughout the sessions ample time had been allowed for the discussion of papers, and the volunteer remarks stimulated, added materially to the value of the program. Among the many contributors in this manner were Stanley Jewett of Oregon, and Theodore S. Palmer of Washington, D. C.

On Saturday evening, 105 members and guests gathered at Omai Khayyam's in the Sequoia Hotel building for the annual dinner. The genius of George Willett as toastmaster made the responses especially happy ones.

On Easter Sunday, April 17, a field trip was taken to the Mendota overflow lands, west of Fresno. At noon, lunch was served by the Fresno Natural History Club to a group of fifty enthusiastic bird watchers. By one o'clock cars were leaving the group, each one containing departing visitors grateful to the Fresno members for their hospitality. Our memories include communion with old friends, recollections of perfect weather, rainbow acres of wildflowers, white egrets, stilts and avocets among the ponds, and overhead the rare sight of numbers of Swainson hawks in migration.

Arrangements for the first annual meeting of the Cooper Club to be held in the "Fresno district" were carried out by the following efficient committee: William T. Shaw (chairman), A. E. Culbertson, Hildegarde Howard, Alden H. Miller, John G. Tyler.—H. W. G.

GOVERNOR'S MEETING

The seventeenth annual meeting of the Board of Governors of the Cooper Ornithological Club was held in the Red Room of Hotel Fresno, Fresno, California, on April 15, 1938. President Willett called the meeting to order at 8:00 p.m., with the following members present: J. S. Appleton, Louis B. Bishop, W. Lee Chambers, Joseph S. Dixon, John T. Emlen, Jr., Hilda W. Grinnell, Joseph Grinnell, Hildegarde Howard, Eric C. Kinsey, C. B. Lastreto, Herbert N. McCoy, Harold Michener, Alden H. Miller, Loye H. Miller, Gayle B. Pickwell, Guy C. Rich, Howard Robertson, John McB. Robertson, Tracy I. Storer, E. Lowell Sumner, Jr., John G. Tyler, and George Willett.

Proxies were presented as follows: Amelia S. Allen, Harold C. Bryant, Henry W. Carriger, Frances Carter, James S. Cooper, Walter K. Fisher, Harry Harris, Jean M. Linsdale, Joseph Mailliard, held by J. Grinnell; Herbert L. Coggins, Curtis Wright, by H. W. Grinnell; Luther Little by George Willett; Sidney B. Peyton by W. Lee Chambers.

Guests present were: Arthur A. Allen, Stanley G. Jewett, Theodore S. Palmer, William T. Shaw, and Selma Werner.

Minutes of the sixteenth annual meeting of the Board of Governors were read and approved. The chairman then called for a report of the Auditing Committee appointed at that meeting, namely, J. S. Cooper, Luther Little, J. R. Pemberton, chairman. In the absence of all three members, Howard Robertson read a letter from Luther Little stating that in company with W. Lee Chambers he had personally checked the securities of the Club as listed in the audit for 1937. This letter is appended to these minutes.

President Willett then called for the report of the Business Manager, W. Lee Chambers, and of the Treasurer, John McB. Robertson, which report is appended to these minutes. Alden H. Miller, seconded by Joseph S. Dixon, moved that the report be accepted and placed on file. The motion was unanimously carried.

President Willett then called upon the Editors to present their report. Alden H. Miller, Associate Editor, complied with a report upon illustrations in the *Condor*, which absorb twenty-five to thirty per cent of the cost of publishing the magazine. He was followed by J. Grinnell, Editor, reporting upon manuscripts submitted, methods of selection of material, and contents of volume 39 of the *Condor*, for 1937. The two reports are appended to these minutes. A motion to adopt these reports was made by J. S. Appleton, seconded by Louis B. Bishop, and unanimously carried. Mr. Grinnell stated that the biennial roster of the Club is now in press, to appear in May, and he circulated copies of the proof.

Mr. Chambers brought before the meeting the fact that the American Ornithologists' Union plans to meet in California in 1939 and asked whether action should be taken at this time to indicate to the A. O. U. the desire of the Cooper Club to aid in making the third visit of the A. O. U. to the Pacific Coast a memorable occasion. Mr. Grinnell stated that President Friedmann of the A. O. U. had already appointed Alden H. Miller as Californian representative of the Union to arrange for the 1939 meeting and that Mr. Miller is planning to attend the Washington meeting in October. He moved that Alden H. Miller be appointed to act as representing also the Board of Governors of the Cooper Club at

the Washington meeting of the A. O. U. and that he be given full power to act for the Board. Motion seconded by Loye H. Miller and unanimously carried.

Dr. Rich moved that a vote of thanks be extended to the local committee for the arrangements which had made the Fresno meeting so pleasant for visiting members. Motion seconded by Mr. Michener and unanimously carried.

Mr. Lastreto reminded the Governors that at the morning session of the Cooper Club, Mr. C. A. Harwell had reported the request of the Fresno Chamber of Commerce for aid in their attempt to discourage the killing of useful and harmless birds by such organizations as the Hanford Chapter of the "Future Farmers of America," whose list of killings in a "vermin control" campaign was published in the "Fresno Bee" of March 20, 1938.

Following comment by Stanley Jewett, Lowell Sumner, Howard Robertson, Louis B. Bishop, and others, Tracy I. Storer moved and Loye H. Miller seconded a motion that the Chair appoint a committee to consider the problem and make recommendations. Motion unanimously carried. President Willett announced the appointment of C. B. Lastreto, J. G. Tyler and L. H. Miller, chairman. [This committee drew up a set of resolutions and determined a course of action approved by a quorum of the Board of Directors, meeting just prior to the annual dinner. Their report is appended to these minutes.]

A motion was made by Howard Robertson, seconded by Loye Miller, and duly carried, that the 1939 Annual Meeting of the Cooper Ornithological Club be held in southern California.

President Willett then announced the next matter of business to be the election of officers for the coming year. He asked permission to vacate the chair temporarily in order that he might himself nominate as his successor Joseph Grinnell. This permission granted, the nomination was seconded by Dr. Bishop. Upon motion by Mr. Lastreto, seconded by Howard Robertson, unanimously favorable action was taken. President Willett declared Mr. Grinnell elected and offered him the Chair. Mr. Grinnell appealed to Howard Robertson, attorney for the Corporation, who ruled that the new chairman should take office at the close of the meeting, not sooner.

John G. Tyler was nominated for Vice-President of the Board by Alden H. Miller, seconded by Loye H. Miller. Mr. Tyler was unanimously elected. Alden H. Miller was nominated for Secretary of the Board by Dr. Rich, seconded by Mr. Appleton, and unanimously elected.

Howard Robertson moved that the present editors, J. Grinnell, J. M. Linsdale, and Alden H. Miller, be appointed to continue in office, subject to the approval of the Board of Directors. The motion was seconded and duly carried.

The business session of the Board being concluded, the Chair called upon the three visiting members of the Club from without the State for remarks. Each of the three, A. A. Allen of Ithaca, N. Y., Stanley Jewett of Portland, Orgeon, and Theodore S. Palmer of Washington, D. C., made appropriate remarks, the last-named in reminiscence of the first Californian meeting of the A. O. U., in 1903.

Adjourned.—HILDA W. GRINNELL, *Secretary pro tem.*

DIRECTORS' MEETING

A meeting of the Board of Directors of the Cooper Ornithological Club was held in the lounge of the Sequoia Hotel, 931 Van Ness Avenue, Fresno, California, at 6:30 p.m. on Saturday, April 16, 1938. The following members of the Board were present: John S. Appleton, W. Lee Chambers, Joseph Grinnell, Alden H. Miller, John McB. Robertson, George Willett.

Senior Vice-President Alden H. Miller presided at the meeting and George Willett acted as Secretary. By unanimous vote, the reading of minutes of the last meeting was deferred until a later meeting.

On motion of John S. Appleton, seconded by W. Lee Chambers, and duly carried, the following officers were elected for the ensuing year: President, Howard Robertson; Senior Vice-President, Alden H. Miller; Junior Vice-President, J. S. Cooper; Secretary, George Willett; Assistant Secretary, Hilda W. Grinnell; Treasurer, John McB. Robertson; Business Manager, W. Lee Chambers; Editor, Joseph Grinnell; Associate Editors, Jean M. Linsdale and Alden H. Miller. Each officer present so elected accepted his office.

The following resolution, presented by Loye H. Miller, C. B. Lastreto and John G. Tyler, was unanimously adopted:

WHEREAS, it has been learned that the San Joaquin Valley Council of the State Chamber of Commerce, at its meeting in Fresno, April 15, has expressed itself as opposed to certain phases of the competitive vermin killing contests by youths of the Fresno area, particular danger being recognized in the possible killing by the boys of species of birds valuable to the State, and

WHEREAS, it is felt that education regarding the habits and economic relations of wild life should precede the efforts at reduction of the numbers of any species,

BE IT THEREFORE RESOLVED, that we, the Cooper Ornithological Club, do hereby commend the attitude taken by the San Joaquin Valley Council and that the secretary be instructed to send copies of this resolution to the Secretary of the said Council and to the Conservation Committee of the State Chamber.

The meeting adjourned at 6:40 p.m.—(Signed) GEORGE WILLETT, *Secretary.*

For Sale, Exchange and Want Column.—Each Cooper Club member is entitled to one advertising notice in any issue of The Condor free. Notices of over ten lines will be charged for at the rate of 15 cents per line. For this department, address JOHN McB. ROBERTSON, Buena Park, California.

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FOR SALE—A file of Zoe, complete except for vol. V, no. 11. This was published between 1890 and 1900, and contains articles by Anthony, Bryant, Jordan, Emerson, Belding, Stephens, Taylor, Cooper, Britton and many others. Price $5.00 plus postage. This set belongs to the Cooper Club and the proceeds of its sale go into the endowment fund.—W. LEE CHAMBERS, *2068 Escarpa Drive, Eagle Rock, Calif.*

WANTED—The Condor, vol. 1; North American Faunas, nos. 23, 27, 28, 33, 36, 46; Biological Survey Bulletins, nos. 7, 11, 16, 19, 28, 41.—LAWRENCE E. HICKS, *Ohio State University, Columbus, Ohio.*

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